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A STUDY OF SOCIAL CAPITAL AND ITS RELATIONSHIP WITH DWELLING STRUCTURE AND ENVIRONMENT BASED ON AN EMPIRICAL ANALYSIS OF LINCOLN, NEBRASKA

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By

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A STUDY OF SOCIAL CAPITAL AND ITS RELATIONSHIP WITH DWELLING STRUCTURE AND ENVIRONMENT BASED ON AN EMPIRICAL ANALYSIS OF LINCOLN, NEBRASKA

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Social capital is described as the concept of social network or social interaction among residents in a neighborhood. In times past, physical environment factors enhancing the level of social capital were main issues to researchers: land-use type and neighborhood design. However, based on various benefits gained from social capital theory, it is needed to study about the influence of social capital. Thus, the impact of social capital on the physical urban environment is investigated in this dissertation research in order to make more livable, healthier, and more active community. Most researches dealing with social capital and housing condition have not been empirically tested comprehensively because there is a lack of consensus about the measurement of social capital. And only structural housing parts were dealt with in their research. In this dissertation, however, the level of social capital is measured through public data sources not household surveys, such as U.S. Census, the City of Lincoln, Lincoln Police Department, etc. Non-structural housing parts related to dwelling environment are also discussed to measure overall housing condition.

Main focus in this dissertation research is to investigate whether the condition of dwelling structure and environment of neighborhoods with a high level of social capital

will be better than the condition of dwelling structure and environment of neighborhoods with a low level of social capital. Also, social capital indices closely associated with housing condition are identified.

According to the results of statistical analysis, there is some impact of social capital on the condition of dwelling structure and environment while controlling other neighborhood characteristics. Especially, structural housing condition and housing exterior condition are affected by the level of social capital significantly. And some social capital indices such as social mobility, marriage rate, own children under 18 years old, homeownership rate, voter turnout, and crime incidence are significant to explain variations of dependent variables' values.

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Jeehoon Kim

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CHAPTER 1: INTRODUCTION

Frequent communication, trust, working together, and volunteering could be generally mentioned to describe a socially desirable community. People living in a socially desirable community usually trust their neighbor due to frequent communication and cooperation which may lead people to work together to settle shared problems. Also, they usually have their own norms regarding their neighborhood, and abide by the norms themselves.

Social capital is a concept of the social relationships (interaction) among people in a neighborhood, which could be a block, a census tract, a county, or a state. Measuring the level of social relationships (i.e., social capital) is considered difficult task because social issues including social capital are generally broad and uncertain. One of the reasons why measuring the level of social capital is difficult is that there is no direct data dealing with social issues. In this sense, many researchers have been trying to capture the level of social capital through household surveys.

In order to measure the level of social capital, various dimensions of social capital might be considered. Although there have been difficulties measuring absolute level of social capital exactly, it may be possible to know the relative level of social capital of a community compared to other communities. In other words, we can figure out whether or not a community is relatively better than other communities regarding their levels of social capital. Neighborhood comparison may allow us to know the relative rankings of communities in terms of their levels of social capital.

According to social cognitive theory, personal cognition affects people’s behavior in relation to environmental factors. Of course, environmental factors also influence people's cognition. In this dissertation research, people's cognition is regarded as a social outcome which indicates social capital. And, there will be an investigation to find out whether the social outcome will have impacts on the physical environment. In the social cognitive theory, three elements (i.e., cognition, behavior, and environment) are closely associated with each other and have influence on one another. Likewise, it is expected that social capital, which is considered as people's social cognition, will be associated with physical environment represented by the condition of dwelling structure and environment. In order to proceed with the dissertation research, the condition of dwelling structure and environment is used as a dependent variable. As mentioned earlier, the condition of dwelling structure and environment is an expanded concept of housing condition. It includes total housing condition, structural housing condition, non-structural housing condition, condition of housing exterior section, condition of garage section, condition of yard/fence section, and condition of driveway/sidewalk section, all of which are the specified dependent variables.

Social capital's impact on the urban physical environment (i.e., dwelling structure and environment) is the main focus in this dissertation research. The following question can give us something to think about: "Does the social capital outcome (social interaction or activities) among residents in a neighborhood influence the condition of dwelling structure and the neighborhood environment?"

Nature of the Problems

Dwelling structure and neighborhood environment are very important to us. The main reason we need housing is associated with dwelling. However, dwelling is not the only reason we need a house. Good housing is expected to provide some services to those living in a house: 1) structural safety for dwelling; 2) opportunities for social interaction and activities.

In recent years, social interaction and activities are more likely to occur by invitation. People invite their neighbor to their house for social interaction and activities. Some authors also mention that life is supposed to take place within the dwelling structure and environment such as the house or backyard. From a social point of view, housing is more than a dwelling unit. It also has social characteristics such as neighborhood services (Vera-Toscano, E., & Ateca-Amestoy, V. 2008).

Only a few authors have focused on the topic of dwelling structure and environment as associated with social capital. There are several reasons for this lack of previous focus. First, collecting social capital data is not a simple task because of its uncertainty and broad concept. Since the geographical unit for analysis is small like a parcel or a census block, it might be much more difficult to deal with this topic because little Census data for social capital now exists. Even though some people might be interested in this topic and have studied it for a while, there are not enough empirical tests showing the relationship or impact of social capital on dwelling structure and environment.

Then what is social capital? Social capital is described as the concept of social network or social interaction among residents in a neighborhood (in a community, or in a state). In times past, many researchers were trying to find factors affecting the condition of social capital. Neighborhood design (walkable neighborhood design) and land-use type (mixed-use land-use) were considered as important factors to enhance the condition of social capital. In other words, a well managed sidewalk-system and traditional land-use type might help residents build a good relationship among each other through frequent encounters on a sidewalk or by having a meeting occasionally in various places (pub, library, restaurant, park, or etc). That is why most traditional neighborhoods had a good condition of social capital compared to contemporary suburban neighborhoods. On the other hand, people living in a contemporary suburban neighborhoods generally tend not to walk because they are driving their car to their destinations. The result is that social interaction or activities are more likely to occur by invitation than by a chance encounter on a sidewalk.

As previously mentioned, in times past, the other authors' main focus was on the factors enhancing the condition of social capital. They believed that the factors (i.e., physical environment) can change people's behavior. Then, the changed behavior can also create better social outcomes such as social capital. However, what about the impact of social capital? What about the impact of social capital on dwelling structure and the neighborhood physical environment? In order to maintain the cycle, such as improving physical environment, changing people's behavior, and acquiring social outcomes, there must be some connection between physical environment and social outcome. (Yunwoo Nam, Clinton (NE) neighborhood meeting for the project of Lincoln Community Assessment)

As a matter of fact, the impact of social capital on specific features (e.g., educational achievement, economic growth, etc) has been discussed in some previous papers. However, physical environment, such as dwelling structure and neighborhood environment, has not been reviewed thoroughly as to whether or not social capital influences the physical environment.

Research Questions

First, this dissertation research examines the concept of dwelling structure and environment, and the concept of social capital. Also their measurements for statistical analysis have been discussed. Housing condition (the condition of dwelling structure and environment) for parcels is measured by surveys. In order to measure the level of social capital of a community, valid indicators obtained from public data sources are utilized based on other literature. Likewise, neighborhood characteristics of communities which are considered as other factors affecting the condition of dwelling structure and environment are also reviewed and measured using public data sources. Lastly, the relationship between the level of social capital and the condition of dwelling structure and environment is examined while controlling other factors (i.e., neighborhood characteristics) affecting the condition of dwelling structure and environment. Also, social capital indices which are closely associated with housing condition (i.e., the condition of dwelling structure and environment) are identified.

In summary, there are two main research questions dealt with in this dissertation research.

1) Does social capital have some impact on the condition of dwelling structure and environment?

In other words, what is the relationship between the level of social capital and the condition of dwelling structure and environment? Can we expect better condition of dwelling structure and environment from good relationship among residents in a community?

2) Among social capital indicators, which indicators are closely associated with the condition of dwelling structure and environment?

When measuring the level of social capital, we will review many indicators based on other literature. Among the indicators representing the level of social capital, which indicators are the most relevant to the condition of dwelling structure and environment? Which indicator are significant to explain variations of dependent variables' values?

To explore the research questions, efforts in this dissertation research include: 1) Defining dwelling structure and environment, social capital; 2) Measuring the condition of dwelling structure and environment through surveys, and measuring the level of social capital from public data sources; 3) Finding neighborhood characteristics, and verifying their impact on dwelling structure and environment; and 4) Statistical Analysis and interpretation of the result.

Hypotheses and Rationale

This dissertation research has two hypotheses. The first hypothesis is that:

1) The levels of social capital in various neighborhoods will be different.

There are many dimensions of social capital: trust, a sense of belonging to a community, norms, volunteering, social integration, political participation, as well as others. Since each neighborhood's social capital levels in each dimension are different, it is expected that the levels of social capital of the neighborhoods will be also different.

Crime rate is one of the indicators representing the level of social capital in the aspect of social integration (as matter of fact, social integration is one of the dimensions of social capital). Generally, each neighborhood has different crime rates because social, cultural, spatial, and various features vary depending on the neighborhood. Thus, the levels of social capital of each neighborhood in terms of social integration are different.

2) The condition of dwelling structure and environment of neighborhoods with a high level of social capital will be better than the condition of dwelling structure and environment of neighborhoods with a low level of social capital.

One neighborhood has a good condition of social capital. This means that residents in the neighborhood are more likely to communicate with each other and work together to resolve shared problems. And, generally they pay more attention to their neighbors and care more about the neighborhood environment because they trust their neighbors and they believe that their concerns are worthy.

At this point, we need to think about the connection between the level of social capital and the condition of dwelling structure and environment. As mentioned earlier, social interaction or social activities are more likely to occur by invitation, not by chance encounters. When they invite their neighbors to their house, they are more likely to clean their dwelling structure and surroundings such as yard, garage, and sidewalk because they do not want to become embarrassed due to poorly managed housing and surroundings. Thus, we can assume that social interaction or activities can lead people to manage their dwelling structure and environment with greater care.

Organization of the Dissertation

This dissertation consists of six chapters. Introduction, problem statements, research questions, and hypotheses and rationale are mentioned in Chapter 1. Chapter 2 reviews other literature regarding dwelling structure and environment and social capital. Descriptions of the study areas are dealt with in Chapter 3. The data described in Chapter 3 will be used to establish control variables which are neighborhood characteristics. Chapter 4 will deal with data collection for statistical analysis. For the data collection, the condition of dwelling structure and environment and the level of social capital will be measured. In Chapter 5, the collected data will be statistically analyzed through an SPSS program and the statistical results will be presented with interpretation. Chapter 6 will include conclusions, as well as discussion of future research directions.

CHAPTER 2: LITERATURE REVIEW

Introduction

In this chapter, theories and concepts are addressed. Dwelling structure and environment and social capital are the main issues to be discussed.

First of all, social cognitive theory provides a conceptual basis for the dissertation research. According to social cognitive theory, people learn how to behave in their daily lives by watching others. Their behaviors are generally affected by physical environment. This means that people mold their own ideas regarding appropriate behaviors which are affected by the physical environment through social interaction or activities.

Witnessing the behavior of others can change a person's way of thinking, which may lead to a change of their attitude toward their neighbors. If only one person has some ideas or a specific way of thinking, the ideas and the way of thinking may be considered as personal ideas. However, if most residents in a community such as a block, a block group, or a county have similar ideas and the same way of thinking, then it is no longer personal ideas. Public ideas and social cognition are considered as social capital outcome which is expected to be associated with physical environment. And, dwelling structure and environment is regarded as the physical environment affecting people's behaviors in this dissertation research.

Dwelling Structure and Environment

The importance of dwelling structure and environment

Dwelling structure and environment involve housing. When people think about the dwelling structure and environment, the first thing which likely comes up in their mind is housing structure. However, housing structure alone is not enough to describe the overall dwelling structure and environment. Housing structure is just the dwelling building. It does not include dwelling environment such as yard, sidewalk, driveway, detached structure, and so on. However, the relationship with social capital can be more fully explained when dwelling structure and environment, which have social capital characteristics, are dealt with together.

Social aspects of dwelling structure and environment

The main reason we need a house is associated with dwelling. Dwelling in a house, however, is not the only reason for the need of housing. Good housing is generally expected to provide some services to those living in a house. One of the services is the structural safety of a building, which is important for people to conduct their daily necessary activities in their houses. Protecting people from dangerous environments such as natural hazards, wild animals, etc., is the primary function of a building. In addition, neighborhood services are also among the advantages that good housing provides people.

According to the *Housing New York City 2008 Executive Summary (Chapter 7 - Housing and Neighborhood Condition)*, "Neighborhood services include not only the physical condition of the neighborhood, but also a broad combination of private and public services needed for daily living." Physical condition of a neighborhood is partly measured and evaluated by focusing on the structural condition of a building. However, the broad combination of private and public services involve other matters which cannot be measured only by the condition of the physical environment of a neighborhood. Social relationships, interaction, and activities among residents are also closely related to neighborhood services.

Services people want to get from their housing include safety, security, and privacy. Not only that, but residents also are likely to think about their houses in relation to neighborhood services. Even though the primary purpose of their houses is related to dwelling services, housing is more than a dwelling unit because it has social characteristics from a social point of view. (Vera-Toscano, E., & Ateca-Amestoy, V. 2007) In this sense, it is expected that dwelling structure and environment might have a connection with social issues such as the role of social capital.

There have been many housing condition surveys conducted in various places. Sacramento County is one of these places. According to their survey results (Sacramento County), it is reported that "Residential structures that are improperly or insufficiently maintained can develop hazardous conditions that may endanger those living within the structure and/ or decrease their overall quality life." Also, Kayode Felix Omole (2010) mentioned that housing has profound influence on the health, efficiency, social behavior, general welfare of the community, etc. Thus, the decreased overall quality of life leads residents living within improperly maintained residential structures to diminish levels of social interactions or activities with their neighbors.

Operationalizing the condition of dwelling structure and environment

Operationalizing the condition of dwelling structure and environment into the study is very important. The condition of dwelling structure and environment is the main dependent variable in this dissertation research. For the purpose of statistical analysis, operationalizing and measuring the condition of dwelling structure and environment is necessary. As mentioned earlier, there are many previous research efforts and papers dealing with the condition of dwelling structure and environment. Even though each author named their methods to collect the data of dwelling structure and environment differently in their research, the objective of the methods selected for review is to evaluate the condition of dwelling structure and environment.

According to the *Whitfield County Housing Condition Study* (May 2007) prepared by the North Georgia Regional Development Center, six categories are evaluated: Roof, foundation, siding/ walls, doors/ windows, and entry. Based on the housing condition assessment guide, raters (residents) can assess housing condition aspects which involve dwelling structural parts. Table 1 shows that the assessment guide highlights types of conditions needing major or minor repairs.

Categories	Assessment Guide	
Roof	Major repairs	Roof material has completely deteriorated or has major patches indicating a new roof surface is needed. Roof is sagging; roof subsurface is rotting; water damage is evident. Brick chimney is substantially deteriorated. Other type of chimney (metal pipe, etc.) runs through window or has other unsafe conditions.
	Minor repairs	Shingle missing; minor patching required If metal roof, sections are corroded or rusted and need to be replaced. Fascia boards are loose or missing Rain gutters falling off or missing Brick chimney has loose brick and other minor signs of deterioration
Foundation	Major repairs	Exterior foundation walls are crumbling causing sagging in exterior walls. Foundation piers are crumbling causing sagging in floors.
	Minor repairs	Significant cracks in cement block/brick or sections of block/brick are missing. Mortar around brick, stone, or concrete block is deteriorating or missing in several locations.
Exterior Walls	Major repairs	50 % or more of the siding needs replacement. Walls are sagging or bulging (e.g. walls are not plumb).
	Minor repairs	Siding needs complete caulking/repainting to prevent water damage. Minor sections of siding are cracked or missing and need replacement.
Doors and Windows	Major repairs	Several windows/doors with broken panes and/or boarded up. Sashes and muntins are completely deteriorated.
	Minor repairs	One or a few windows/doors with 1 or 2 broken panes. Sashes and muntins are in poor condition.
Entryways (porches, porticos, stoops, etc)	Major repairs	Sagging floors; stairs or railings missing; holes in floor; visibly rotten boards
	Minor repairs	Floors uneven; railing spokes missing; cracks in roof of porch

Table 1. Housing condition assessment guide
(Whitfield County Housing Condition Study Final, May 2007, Page 14)
Prepared by the North Georgia Regional Development Center
In conjunction with the Dalton–Whitfield Community Development Corporation

Survey Date: ________________ Surveyed by:___________________Total Score_________

Occupancy Type: ___ Single Family Detached; _____ Manufactured Home;
____ Inhabited; _____ Not Inhabited

	Points	Structural Condition	Type/Material	Score
Roof	0	No repairs needed	___ Asphalt Shingle	
	25	Needs minor repairs	___ Tar Paper	
	100	Needs major structural repair	___ Metal	
Foundation	0	No repairs needed	___ Piers	
	25	Needs minor repairs	___ Brick/Block	
	100	Needs major structural repair	___ Wood	
Siding/Walls	0	No repairs needed	___ Wood/masonite	
	5	Needs minor repairs	___ Brick/block	
	50	Needs major structural repair	___ Asbestos	
			___ Metal/vinyl	
Doors/Windows	0	No repairs needed		
	5	Needs minor repairs		
	10	Needs major structural repair		
Entry Way	0	No repairs needed		
	5	Needs minor repairs		
	10	Needs major structural repair		

Table 2. Housing condition survey form
(Whitfield County Housing Condition Study Final, May 2007, Page 13)
Prepared by the North Georgia Regional Development Center
In conjunction with the Dalton–Whitfield Community Development Corporation

Table 2 shows housing condition survey format details used in Whitfield County (Georgia). Raters evaluate each category by scoring them according to the housing condition assessment guide. For example, if the roof condition of a house is in the condition needing minor repairs, 25 points as a score will be given to the category. In this way, all categories are evaluated and scored to describe the condition. Then, the points (scores) are totaled up to make a composite score representing the condition of a house. The higher the total score, the poorer the housing condition. The system of calculating and adding up scores is developed to identify which house is in the greatest need of assistance to repair or improve.

A West University neighborhood, housing condition assessment also was conducted in December 2004. Table 3 presents the assessment evaluation criteria. There are eight elements: foundation, stairs/ rails/ porches, roof, exterior surfaces, windows/ doors, driveways, sidewalks, and landscaping.

Table 3.1 External housing condition assessment evaluation criteria
West University Neighborhood Housing Condition Assessment Draft Report, August 2004, Page 47
(Community Planning Workshop, Community Service Center, 1209 University of Oregon)

EVALUATED ELEMENTS	**6 Well Maintained**	**5 Moderately Well Maintained**	**4 Needs Only Minor Repair**	**3 Needs Moderate Repair (Up to 1/4 of element needs repair.)**	**2 Needs Major Repair (Up to 1/2 of element needs repair)**	**1 Not Salvageable (Majority of element needs repair.)**	**Score**
Foundation – The wall of poured concrete, concrete blocks or stones that support the weight of the house.	Does not need immediate maintenance.	Some peeling or cracking in the protective surface over only a small portion.	A few small cracks, small amount of missing mortar, a small hole over a small area of the surface.	Cracks, missing mortar, loose or broken surface over a moderate portion. No evidence of settling or out of vertical alignment.	Cracks, missing mortar, loose or broken surface over a large portion. Some evidence of settling or out of vertical alignment.	Cracks, missing mortar, loose or broken surface over a majority of the foundation. Evidence of major settling or out of vertical alignment.	
Stairs, Rails, Porches – Steps and risers from level to another; the bar used for a handhold; area adjoining an entrance to a building and usually having a separate roof.	Does not need immediate maintenance.	Paint needs minor touch ups.	One missing, broken, or cracked step, riser, baluster, handrail, or railing that needs minor repairs or paint.	More than one missing, broken, or cracked steps, risers, balusters, handrails, or railings that need minor repairs or paint. Not a serious safety concern.	Between 1/4 to 1/2 of the step, risers, balusters, handrails, or railings are missing, broken, rotting, or cracked. Hazard of tripping or falling because of disrepair.	A majority of the steps, risers, balusters, handrails, or railings are missing, broken, rotting, or cracked. Hazard of tripping or falling because of disrepair.	
Roof, Gutters, Downspouts, Chimneys – Material that forms the outer protection against the weather; troughs connected to spouts that route water away from the structure.	Does not need immediate maintenance.	Small leaves on the roof or gutters that may need to be cleaned out.	Need minor repairs to correct a missing or sagging shingle, gutter, or downspout; cracked or missing brick or mortar in chimney; or moss growing on the roof.	More than one missing or sagging shingle, gutter, or downspout; cracked or missing brick or mortar in chimney; cracked or rotting fascia affecting less than 1/4 of the roof and chimney elements.	Missing, buckling, or sagging shingles; holes in the roof or chimney; missing or loose gutters or downspouts; chimney settling or leaning; cracked or rotting fascia affecting between a 1/4 and 1/2 of the roof and chimney elements.	Missing, buckling, or sagging shingles; holes in the roof or chimney; missing or loose gutters or downspouts; chimney settling or leaning; cracked or rotting fascia affecting the majority of roof and chimney elements.	
Exterior Surfaces – protective surfaces including paint, siding, or other material and the structural elements that add strength, bear weight, or insulate the structure.	Does not need immediate maintenance.	Isolated areas where some touch up painting is needed.	Paint and/or siding need some repair work, but there is no evidence of structural decay.	Paint and/or siding need repair work and there is evidence of some structural decay, such as dry rot, affecting up to 1/4 of the surface.	Major repair work is needed to correct paint, siding, or other parts of the protective surface. There are areas of structural decay affecting up to 1/2 of the surface.	A majority of the protective surface is missing, loose, rotting, or broken allowing weather to reach the structural elements of the structure.	

Table 3.2 External housing condition assessment evaluation criteria
West University Neighborhood Housing Condition Assessment Draft Report, August 2004, Page 48
(Community Planning Workshop, Community Service Center, 1209 University of Oregon)

EVALUATED ELEMENTS	6 Well Maintained	5 Moderately Well Maintained	4 Needs Only Minor Repair	3 Needs Moderate Repair (Up to 1/4 of element needs repair.)	2 Needs Major Repair (Up to 1/2 of element needs repair)	1 Not Salvageable (Majority of element needs repair.)	Score
Windows & Doors – All doors and door frames; and windows including panes of glass set in a frame.	Does not need immediate maintenance.	All doors, frames, and glass present; may have an isolated instance needing a touch up, such as replacing a latch or other hardware.	Need minor repairs to correct a broken or cracked frame, rehang a door, or other small hole related to a door or window.	There are missing or broken panes, broken or rotting window or door frames, or other holes related to a door or window failure affecting up to 1/4 of all of the windows and doors.	There are missing or broken panes, broken or rotting window or door frames, or other holes related to a door or window failure affecting between a 1/4 to 1/2 of all the windows and doors.	A majority of the windows and doors are failing. There are missing or broken panes, broken or rotting window or door frames, or other holes related to a door or window.	
Driveways - private road giving access from a public way to a building on abutting grounds	Does not need immediate maintenance.	May have "hairline" cracks; driveway is level and there is no evidence of buckling.	No more than one obvious crack.	Uneven driveway with some cracking.	Uneven driveway is buckling and there is loose or missing cement.	Majority of the driveway is buckling and there is loose or missing cement.	
Sidewalks -paved walk for pedestrians at the side of a street	Does not need immediate maintenance.	May have "hairline" cracks; sidewalk is level and there is no evidence of buckling.	No more than one obvious crack affecting only one slab.	Uneven sidewalk with some cracking in up to 1/4 of the slabs.	Uneven sidewalk is buckling and there is loose or missing cement affecting between a 1/4 to 1/2 of the slabs.	Majority of the sidewalk is buckling and there is loose or missing cement.	
Landscaping – The planning, design, management, and preservation of vegetation on the land.	Yard well maintained (grass mowed, shrubs trimmed, few weeds, etc.) with landscaping.	Mowed yard; no landscaping.	Unmowed; signs of irregular tending. Small patches of exposed dirt in the lawn.	Unmowed; weeds taller than 18"; Patches of exposed dirt in up to a 1/4 of the lawn; potholes.	Half or less of the site is overgrown with shrubs or thick brush; weedy; between a 1/4 to 1/2 of the yard has exposed dirt.; numerous potholes	Entire site is overgrown and unkempt; nearly all plants are dead; trenches; deep potholes. (Area designed to be a maintained yard.)	

In the same manner of calculating scores as used in the Whitfield County (Georgia) study, a composite score for overall housing condition is obtained by adding up scores from all eight elements. If all of the elements are rated as “well maintained,” the score of “48” will be given to the house.

The external housing condition assessment conducted in the West University neighborhood study has an additional element when compared to other housing condition surveys. Landscaping, included in the West University neighborhood study, is the element which usually has not been dealt with in other housing condition surveys. Generally landscaping assessment is not likely to be associated with dwelling structure assessment. However, the external housing condition assessment conducted in the West University neighborhood study has used the element of landscaping to evaluate external housing condition. Yards were evaluated to assess the condition of landscaping in the dwelling structure assessment.

In Sacramento County (California), the Planning and Community Development Department conducted a housing condition survey in 2010. There are three elements evaluated in their housing condition survey: siding/stucco, roofing, and windows. Table 4 shows the assessment guide, and Table 5 defines the housing condition based on total rating.

Siding / Stucco	0 point - Does not need repair. 1 points - Needs re-painting − thin, peeling or missing paint. Paint was not considered necessary on well-maintained masonry structures. 5 points - Needs to be patched and re-painted − siding with gaps or small holes which could allow moisture or rot into the structure. This may also include large visible cracking in the stucco. 10 points - Needs replacement and painting − siding or stucco with one or more holes too large to patch, excessive rotting requiring replacement, or wire is visible where stucco is missing. 31 points - Dilapidated − a unit suffering from excessive neglect, where the building appears structurally unsound and maintenance is nonexistent, not fit for human habitation in its current condition, may be considered for demolition or at a minimum, major rehabilitation will be required.
Roofing	0 point- Does not need repair. 5 points - Shingles missing/Chimney needs repair − swollen or curled shingles, poor flashing around chimney, or unevenness. 10 points - Needs re-roofing − severe wearing on the roof, serious unevenness, pooling, and gaps or holes in the roof. 25 points - Roof structure needs replacement and re-roofing − serious dipping in the roof, roof partially missing, or appearance of being unsound.
Windows	0 point - No repair needed. 1 points - Broken window panes − cracked window, separation and unevenness of window in frame. 5 points - In need of repair − broken window or large gaps between the window and structure frame. 10 points - In need of replacement/missing − pane missing or replaced with a board, does not include window removal to accommodate water coolers.

Table 4. Assessment guide for housing condition survey
Sacramento County Housing Conditions Study, April 2010, Page 5
(County of Sacramento Municipal Services Agency Planning and Community Development Department)

Total Rating	Condition	Definition of Condition
5 or Less	Sound	A unit that appears new or well maintained and structurally intact. There should be straight roof lines. Siding, windows, and doors should be in good repair with good exterior paint condition. Minor problems such as small areas of peeling paint and/or other maintenance items are allowable under this category.
6 to 10	Minor	A unit that shows signs of deferred maintenance, or which needs only one major component, such as a roof.
11 to 20	Moderate	A unit in need of replacement of one or more major components and other repairs, such as roof replacement, painting, and window repairs.
21 to 30	Substantial	A unit that requires replacement of several major systems and possibly other repairs (e.g. roof structure replacement and re-roofing, as well as painting and window replacement).
31 and over	Dilapidated	A unit suffering from excessive neglect, where the building appears structurally unsound and maintenance is nonexistent, not fit for human habitation in its current condition, may be considered for demolition or at a minimum, major rehabilitation will be required.

Table 5. Definition of housing condition based on total rating
Sacramento County Housing Conditions Study, April 2010, Page 7
(County of Sacramento Municipal Services Agency Planning and Community Development Department)

Sacramento County (California) developed an assessment guide for housing condition surveys. It helps raters score the conditions of each element. Then, after the survey is completed for a dwelling, all scores from each element are totaled up to make a composite score. Sacramento County also evaluated housing condition based on a total rating. Definition of overall housing condition based on a total rating is the critical factor differentiating Sacramento County's case from other housing condition surveys. If the total score of a house is 31 or over, it identifies "A unit suffering from excessive neglect, where the building appears structurally unsound and maintenance is nonexistent, not fit for human habitation in its current condition, may be considered for demolition or at a minimum, major rehabilitation will be required."

There is another housing condition survey. National Energy Services in UK (UK's home for independent energy assessors, home inspectors, surveyors and low carbon professionals) operates two schemes: energy assessor accreditation scheme and SAVA (Surveyors and Valuers Accreditation) scheme. The SAVA scheme is for residential surveyors who hold home inspecting certificates. They conduct home condition surveys (HCS). The report from the home condition surveys is for home buyers before they buy a property in order to protect their investment. The home condition surveys (HCS) includes 3 main parts: outside, inside, and services. Outside parts evaluated are chimney stacks, roof coverings, rainwater pipes & gutters, main walls, windows, outside doors, all other woodwork, outside decoration, and other outside detail. Table 6 shows the elements included in the inside parts and services respectively.

Section of the Report	Part No	Name	Identifier (if more than one)	Rating
D: Outside	D1	Chimney stacks		1
	D2	Roof coverings		1
	D3	Rainwater pipes & gutters		2
	D4	Main walls (including claddings)		3
	D5	Windows		1
	D6	Outside doors (incl. patio doors)		1
	D7	All other woodwork		X
	D8	Outside decoration		1
	D9	Other outside detail		1
E: Inside	E1	Roof structure	Roof structure	2
	E1	Roof structure		NI
	E2	Ceilings		1
	E3	Inside walls, partitions & plasterwork		1
	E4	Floors		2
	E5	Fireplaces & chimney breasts		1
	E6	Built-in fittings		1
	E7	Inside woodwork		1
	E8	Bathroom fittings		1
	E9	Other issues		X
F: Services	F1	Electricity		1
	F2	Gas / Oil		1
	F3	Water		2
	F4	Heating		2
	F5	Drainage	Drainage - above ground	1
	F5	Drainage	Drainage - below ground	NI

Table 6. A summary of the condition ratings
* Source: An example of home condition survey, May 2008, Page 8
(Report Reference Number: 322695)

Compared to other housing condition surveys, “home” assessed in SAVA (Surveyors and Valuers Accreditation) HCS (Home Condition Surveys) scheme operated by National Energy Services is different from a house or a dwelling structure assessed in other surveys. The SAVA HCS (Home Condition Surveys) scheme involves whole issues including outside parts, insides parts, and services when inspecting a dwelling structure in more detail. For example, services such as electricity, gas/oil, water, heating, and drainage are evaluated in this home condition surveys (HCS). As a matter of fact, in order to inspect the services, raters should have some professional knowledge related to each category to rate them. Also, when residential surveyors assess home condition, they need permission from residents because it is necessary to get access to inside of a house to assess other parts: inside and services.

And, the condition ratings in the SAVA (Surveyors and Valuers Accreditation) HCS (Home Condition Surveys) scheme operated by National Energy Services are as follows. Condition Rating 1 represents that “no repair is currently needed. Normal maintenance must be carried out.” Condition Rating 2 shows that “repairs or replacements are needed but the surveyor does not consider these to be serious or urgent.” And Condition Rating 3 means that “these are defects which are either serious and/or require urgent repair or replacement or where the surveyor feels that further investigation is required (for instance where he/she has reason to believe repair work is needed but an invasive investigation is required to confirm this). A serious defect is one which could lead to rapid deterioration in the property or one which is likely to cost more than 2.5% of the reinstatement cost to put right. The surveyor may wish to obtain quotes for additional work where a Condition Rating 3 is given, prior to exchange of contract.”

Following is another neighborhood housing assessment conducted in the Housing Studies Program at the University of Minnesota, St. Paul. The assessment as a housing studies program conducted at University of Minnesota is an analysis to focus on structural characteristics and conditions of dwellings while studying demographic and other local issues. According to the student workbook, neighborhood housing assessment is important to make an overall plan for community development. It assesses seven sections: foundation, roof, siding, doors/windows, yard, chimney, and garage. The big difference between other housing condition surveys and this neighborhood housing assessment is garage (i.e., detached structure). Most of housing condition surveys examined have involved only dwelling structure, which is a house. Even though some other assessments dealt with inside parts of housing, services, and management, a garage has not usually been evaluated.

Housing Conditions:	Excellent (5)	Good (4)	Average (3)	Poor(2)	Deter-iorated (1)	Comments
Foundation						
Roof						
Siding						
Doors/Windows						
Yard						
Chimney						
Garage						
Other						

- **Excellent (5)** – no apparent problems
- **Good (4)** – A structure recently built and meeting codes or which, if somewhat older, has had careful maintenance of both structure and grounds. No surface wear is apparent and repairs are not needed.
- **Average (3)** – (Minor Deficiency). A sound structure but in need of surface maintenance and possibly showing small signs of wear. The structure is not as well maintained as the "good" category and the pavement or accessory building may need repairs. Minor maintenance needed.
- **Poor (2)** – (Major Deficiency). Significant surface wear is noticeable. The structure is slightly out of plumb with cracks, holes, or breaks evident in walls, foundation, and roof. Paint is blistered and windows, steps, etc., may need to be replaced. Major maintenance is needed.
- **Deteriorated (1)** – (No Rehabilitation Feasibility). The structure is unsound and totally substandard. The foundation, roof, and bearing elements have substantial defect.

Table 7. Neighborhood Housing Assessment survey form
A Guide to Neighborhood Housing Assessment: A Student Workbook, Page 14.
(Housing Studies Program at the University of Minnesota, St. Paul)

A garage is a detached structure. It is not supposed to be used as a dwelling. In the neighborhood housing assessment survey, a detached structure is evaluated because a garage is likely to have something to do with dwelling structure or environment in other aspects. Although a garage does not provide people with a space (room) to stay or dwell, it helps residents live more conveniently. For instance, people park their cars in the garage to protect it from dangerous situations, and they can use a garage as storage to keep possessions. The housing condition survey for the neighborhood housing assessment used five scales to evaluate each section: excellent, good, average, poor, and deteriorated.

The City of Pleasant Hope in Missouri has also been conducting a housing condition and site survey. The survey questions consist of 2 parts: one is the structural part and the other is the non-structural part. The questions in the structural part are almost same as other housing condition surveys' questions, addressing paint peeling, exterior walls, foundation, porch, steps, windows/doors, guttering, roofing, chimney, and garage/carport. However, non-structural parts are somewhat different. The questions in the non-structural parts include landscaping, litter, and driveway which are relevant to dwelling environment, not dwelling structure. The following Figure 1 shows the Pleasant Hope housing condition and site survey form.

Pleasant Hope Housing Condition and Site Survey

Surveyor's initials: ___________ Address: ______________________________
Block: ___________ Other on-site use: _____________________

Housing Classification:

Type:	Single family	Duplex	Triplex	Apartment	Mobile
Age:	*Pre 1920's*	*1920-WWII*	*Post WWII*	*Mid 1970's*	*2000 +*

Rating of exterior/structural deficiencies:

	0=None	1=Slight	2=Moderate	3=Critical	Value	Total
STRUCTURAL						
Paint	0	1	2	3	1	______
Exterior Walls	0	1	2	3	2	______
Foundation	0	1	2	3	3	______
Porch	0	1	2	3	2	______
Steps	0	1	2	3	1	______
Windows/Doors	0	1	2	3	2	______
Guttering	0	1	2	3	2	______
Roofing	0	1	2	3	3	______
Chimney	0	1	2	3	1	______
Garage/Carport	0	1	2	3	2	______
Wall material:	*Wood*	*Brick*	*Vinyl Siding*	*Other Siding*	Total	______
Overall Rank:	Standard (0-10)	Substandard Minor (11-24)	Substandard Major (25-40)	Dilapidated (41+)		
NON-STRUCTURAL						
Landscaping	0	1	2	3	1	______
Litter	0	1	2	3	1	______
Driveway	0	1	2	3	1	______
Driveway Material:	*Dirt*	*Gravel*	*Concrete*	*Asphalt*	Total	______
Overall Rank:	Standard (0-3)	Substandard Minor (4-6)	Substandard Major (7-8)	Dilapidated (9)		

COMMENTS / SIGNIFICANT FEATURES:

Figure 1. Pleasant Hope housing condition and site survey
Pleasant Hope Comprehensive Plan 2012, Appendix A-Housing Condition Survey Instrument.
(The City of Pleasant Hope, Missouri.)

Each element is rated on a scale from 0 to 3. A rating of "0" means that there is no visible problem, and a rating of "3" indicates a critical problem. The City of Pleasant Hope survey form also has assigned a weighted value to each element from 1 to 3. The weighted value is based on the relative importance of the element to the overall condition of a dwelling structure.

According to Figure 1, a weighted value of "3" is given to the elements which are more important, such as foundations and roofs. Less important elements, such as paint, porch, and chimney have a weighted value of "1." A rating value for an important element such as roofing is multiplied by a weighting value of "3," so a "critical" assessment of "3" times a weighting value of "3" can contribute an overall value of "9" to the survey for example.

The last example of a housing condition survey was conducted in Fresno County, California (*Fresno County General Plan, March 2003, Housing Condition Survey*). Overall property conditions were evaluated in this housing condition survey. This survey includes some other aspects of dwelling structure and environment, such as trash, rubbish, fence, and debris and junk car (non-operating vehicles) in yard.

#1 FOUNDATION

0	Existing foundation in good order
15	Needs partial foundation
25	Needs complete foundation

#2 ROOFING

0	Does not need repair
5	Needs patching
10	Needs structural repair
15	Roof structure needs replacement and re-roofing

#3 SIDING

0	Does not need repair
3	Needs painting
4	Needs to be patched and repainted
10	Must be replaced and painted

#4 WINDOWS

0	No repair needed
5	In need of repair
10	In need of replacement

#5 DOORS

0	No repair needed
1	Repainting needed
3	Replacement needed

#6 OVERALL PROPERTY CONDITON
(_____ Check if applicable)

_______ Trash, rubbish, debris in yard
_______ Landscaping is unkept, overgrown
_______ Fencing is in poor condition
_______ Non-operating vehicles in yard

Figure 2. Housing condition survey forms
(Fresno County General Plan, March 2003, Housing condition survey, Appendix D)

In most housing condition surveys, the survey methodology and basic survey questions originated from a standard State of California survey form. The survey questions and formats from the Housing and Community Development Department (HCD) Community Development Block Grant (CDBG) program were used and revised in other housing condition surveys. Main sections (categories) mentioned in the housing condition survey conducted by Housing and Community Development Department (HCD) Community Development Block Grant (CDBG) program are foundation, siding/stucco, windows, roofing, and electrical. Of course, some other housing condition surveys conducted in other counties or cities have somewhat different survey sections (or categories) depending on the purposes of their researches or projects. However, the main sections mentioned above are commonly used in most housing condition surveys. In addition, although most of the housing condition surveys studied handled a building's structural part, some other surveys paid attention to the other aspects of housing, such as landscaping, yard, garage, and so on.

Most housing condition surveys or dwelling assessments consist of a structural part and an environmental part. Survey questions from Housing and Community Development Department (HCD) Community Development Block Grant (CDBG) program have dealt with only the dwelling structural part which is physical condition of housing. However, when considering other social interaction or activities occurring in the dwelling environment (i.e., surrounding a house), other elements, such as yard, sidewalk, and detached structure, need to be considered and evaluated in order to check the housing environmental condition. Thus, some other housing condition surveys are dealing with the environmental aspects of a house.

In most housing condition surveys, the method to assess overall housing condition is to total up all scores from all sections. For example, if a rating of foundation is “10,” of windows is “5,” of roofing is “10,” of siding/stucco is “20,” and of electrical is “10”; then the overall housing condition value can be obtained by totaling these scores (10 + 5 + 10 + 20 + 10 = 55). Thus the total score for overall housing condition of the house would be “55.”

In some other housing condition surveys (The city of Pleasant Hope, Missouri, Housing Condition and Site Survey), there is also a weight value based on the relevant importance of each section to overall housing condition. According to a survey using weights, some sections are more important and valuable than other sections. Thus when the given weighted value is assigned to each section, the total score for overall housing condition would be different. For example, foundation and roofing are regarded as more important sections as mentioned in the Housing and Community Development Department (HCD) Community Development Block Grant (CDBG) program. Thus, weighted values of “2” and “3” are assigned to foundation and roofing respectively based on their relevant importance. Other sections have a lower weighed value of “1.” From the relative weighed values of each section, it is possible to know how much importance is given to each question. So, foundation might be 2 times more important than other sections, or roofing is 3 times more important than other sections.

Thus, the overall housing condition might be different from the first summed score for overall housing condition because of the relative weighed value of each section. When the weighted values of foundation – 2 and roofing - 3 are assigned in two sections, the total score for overall housing condition will be 85 (10*2 + 5*1 + 10*3 + 20*1 + 10*1 = 85).

Social Capital

Uncertainty and vagueness of social capital make it difficult to understand. However, most researchers studying social capital think that it plays an important role and is applicable to various fields in our society: defining social problems, suggesting appropriate solutions, predicting and checking results. These roles of social capital, of course, aim to enhance sustainable community development. However, there are still problems defining and measuring social capital because of lack of consensus about its' definition and measurement.

What is social capital?

Portes (1998) identified three types of capital: 1) economic capital; 2) human capital; and 3) social capital. When people try to interpret these three terms (i.e., economic, human and social capital) literally, there is more of a problem understanding social capital which seems vague and uncertain.

In fact, there are many similar words used to refer to social capital including social bonds, community networks, social ozone, extended friendships, community life, social resources, informal and formal networks, and social glue (Portes, A. 1998). What can we infer from these different terms which are based on different theoretical backgrounds? It is hard to explain social capital, and this difficulty regarding clarifying a definition of social capital leads researchers to also have problems measuring social capital.

For this reason, authors in relevant literature assure that there is no set and commonly agreed definition of social capital. The definition of social capital is dependent on the specific disciplines involved and the level of investigation (Robison et al. 2002).

Many researchers have their own definitions of social capital, which leads to various social capital theories and measurement approaches.

In spite of the confusion and difficulties, the concept of social capital is adopted in various disciplines because of its benefits in studying crime (Halpern 1999, Putnam 2000), health (Wilkinson, 1996), education (Coleman, 1988), child welfare (Healy, T., & Côté, S, 2001), and economic security (Fukuyama, 1995).

Before figuring out the importance or benefits of social capital, it is necessary to apply a particular definition of social capital. In fact, social capital is not a new concept. Many authors have attempted to define social capital. The following table presents the definitions of social capital given by various authors.

Authors	Definitions of Social Capital
Bourdieu (Bourdieu 1986)	'The aggregate of the actual or potential resources which are linked to possession of a durable network of more or less institutionalized relationships of mutual acquaintance or recognition.'
Portes (Portes 1998)	Social capital inheres in the structure of people's relationships..
Coleman (Coleman 1990)	'Social capital is defined by its function. It is not a single entity, but a variety of different entities having two characteristics in common: They all consist of some aspect of social structure, and they facilitate certain actions of individuals who are within the structure.'
Fukuyama (Fukuyama 1997)	'Social capital can be defined simply as the existence of a certain set of informal values or norms shared among members of a group that permit cooperation among them.'
Putnam (Putnam 1995)	'Features of social organization such as networks, norms, and social trust that facilitate coordination and cooperation for mutual benefit.'
Woolcock (Woolcock 1998)	'The information, trust, and norms of reciprocity inhering in one's social networks.'

Table 8. Definitions of social capital by authors

Among them, Robert Putnam's work is now most commonly associated with the concept of social capital. He has approached the concept of social capital from a political science perspective. According to him and his colleagues, social capital can be defined as network, norms, and trust that enable participants to act together more effectively to pursue shared objectives (Baron et al. 2000). In addition, according to a report from authorities at the World Bank (social capital part, http://www.worldbank.org/poverty/scapital/index.htm), social capital refers to norms and networks that enable collective action. Increasing evidence shows that social capital is critical for poverty alleviation and sustainable human and economic development.
In this way, many authors have contributed their own definitions to social capital research. Those definitions have something in common. And, there are also some differences between the definitions.

Benefits of social capital theory

Despite the uncertainty of its definition and measurement, social capital researchers, planners, and policy makers still have interest in the concept. In other words, although there are problems in terms of clarifying its definition, the importance of social capital theory is apparent according to related literature. However, the majority of benefits described in the literature have not been empirically tested thoroughly because there is a lack of consensus about the measurement of social capital. Some benefits are just inferred theoretically based on some other aspects of social capital.

Despite its unclear measurement and vague definitions, the benefits and importance of the concept of social capital are mentioned continuously in urban planning and urban policy literature. That is why the concept of social capital and its theory have been used in research. For example, Requena (2003) suggested that the importance of social capital is that it brings together several important sociological concepts, such as social support, integration and social cohesion. Some authors have placed an emphasis on economic and political issues when they discuss the benefits of social capital (Fukuyama 2001; Kenworthy 1997). The benefits of social capital theory are also dealt with in the health discipline (Wilkinson 1996). Bankston and Zhou (2002) interpreted the inter-personal trust aspect by using the concept of social capital. Public health enhancement, raising educational attainment, economic growth, low crime rate, increasing political and civic engagement, and environmental management, are among the benefits discussed in recent literature. Despite the fact that empirical tests to prove benefits are still in progress, many researchers, planners, and policy makers have interest in social capital theory, and think its application to be useful in their disciplines.

The development of social capital theory

The concept of social capital is nothing new. More recently, social capital is employed by many authors, even though they are still seeking to define it and its benefits properly. Thus, in order to apply the concept of social capital to various disciplines, theoretical understanding about social capital is important and necessary.

Social capital theory is quite complex. All theories (including social capital theory) dealing with social issues, of course, are generally complex. However it is expected that the social capital theory associated with various disciplines (economy, policy, education, etc) is more complex than usual.

Social capital is a broad term. Woolcock (1998) stated that the term social capital represents “norms and networks facilitating collective actions for mutual benefits.” This broad definition of social capital makes it possible to interpret social capital in various ways (Portes, 1998). There are many theories regarding social capital. Among the theories, one theory relevant to this dissertation research is discussed and then the components of social capital theory are explored.

Social network researchers regard “relationships” or “ties” as the basic data for analysis. A network can be defined as the pattern of ties linking a defined set of persons or social actors. Each person can be described in terms of his or her linkages with other people in the network (Knoke, D., & Kuklinski, J. H. 1982). In this sense, Granovetter (1973) suggested weak tie theory. This theory is focused on the strength of the social ties. According to the author’s investigation, the weak tie theory is relevant when people are exchanging some specific information which is crucial for finding a job. And the ties among members of a social clique are more likely to be strong. Strong social ties represent emotionally intense, frequent ties and involve multiple types of relationships, such as friendship, advice, and coworker. The information which is necessary for finding a job possessed by anyone of the members in the clique is likely to be shared quickly. However, if the social tie is weak (the ties reached outside of the social clique are considered as being weak social ties), the information is not likely to be shared as quickly.

Granovetter (1973) also asserted that networks and relationships are key factors creating the concept of social capital. Of course, the networks and relationships are important regarding forming the concept of social capital. However, the by-product (i.e., information for finding a job) of networks and relationships between people should be considered as an important and crucial issue. That is because the by-product of networks and relationships can have direct impact on a society by enhancing sustainable community development.

A number of social capital theories are made up of the following components. Even though the concept of social capital is quite complex, social capital theories can be explained by these components: dimensions, types, determinants and level.

Dimension of social capital

When people start thinking about social capital, there are many different kinds of ideas or notions that come to mind. It is not possible to depict the concept of social capital by using one word or a single sentence.

The concept of social capital has various dimensions, which shows the multi-dimensional characteristic of social capital. The reason it is difficult for people to define the concept of social capital is probably related to this multi-dimensional characteristic.

Some authors have placed more emphasis on the trust dimension since they think trust is the most appropriate to represent the concept of social capital. Some other authors consider network as the main dimension of social capital.

As a matter of fact, one dimension alone cannot explain or constitute the concept of social capital. A multi-dimensional perspective on social capital is important for this reason. Table 9 presents that each author thinks differently in terms of social capital's main dimensions.

Dimensions	Authors
Trust	Coleman 1988; Collier 1998; Cox 1997; Kawachi et al. 1999a; Kilpatrick 2000; Leana and Van Buren III 1999; Lemmel 2001; Putnam 1993; Putnam et al. 1993; Snijders 1999; Welsh and Pringle 2001
Rules and norms governing social action	Coleman 1988; Collier 1998; Fukuyama 2001; Portes and Sensenbrenner 1993
Types of social interaction	Collier 1998; Snijders 1999
Network resources	ABS 2002; Kilpatrick 2000; Snijders 1999
Other network characteristics	Burt 1997; Hawe and Shielle 2000; Kilpatrick 2000; Putnam 1995

Table 9. The main dimensions of social capital (Hean et al. 2003, Page 30)

The various dimensions identified by other authors are as follows; informal social ties, formal social ties, and norms of collective action which are identified by Liu, Amy Qiaoming, and Terry Besser (2003).

In addition, there are two important points in terms of social capital’s dimensions. First, social capital is multi-dimensional. The other point involves the relationship among the dimensions. Although it seems that there are many dimensions involving social capital and they are all separated from each other, they are all connected and they have a strong influence on one another.

Types of social capital

The types of social capital are also diverse. Bonding or bridging social capital, cognitive or structural social capital, open or closed social capital, and thin or thick social capital, are types of social capital.

First of all, the distinction between bridging and bonding social capital is that bonding is horizontal, and bridging is vertical. Bonding social capital represents that social capital is considered as being found among people who live in the same or adjacent communities.

However, bridging social capital is referred to as being shared in organizations (Narayan 2002 and Wallis 1998).

And, the distinction between cognitive and structural social capital is also one of the types of social capital to be considered important. Structural social capital facilitates collective actions which are beneficial reciprocally by establishing roles and social networks. According to Hitt et al (2002), however, the roles and social networks are fortified by procedures and precedents. Cognitive social capital predisposes people toward mutually beneficial collective action through shared norms, values, attitudes, and beliefs (Krishna and Uphoff 2002). Cognitive and structural forms of social capital are commonly connected and mutually reinforcing (Uphoff and Wijayaratna 2000).

There are also several types of social capital: strong ties (intensive and repeated) vs. weak ties (temporary and contingent); vertical social capital (operating through formal hierarchical structures) vs. horizontal social capital (in which authority is more decentralized); open social capital (civically engaged and exercising open membership) vs. closed social capital (protective and exercising closed membership) (Heffron 2000).

Determinants of social capital

Determinants of social capital are also important to consider. As mentioned earlier, the main point of an argument regarding social capital is a lack of consensus about definitions, dimensions, and measurement. In the same manner, people are still disputing the determinants of social capital. Most authors investigating and having interests in social capital have suggested their own ideas regarding the determinants. The main determinants of social capital include: history and culture; whether social structures are flat or hierarchical; the family; education; the built environment; residential mobility; economic inequalities and social class; the strength and characteristics of civil society; and patterns of individual consumption and personal values (Aldridge, Halpern et al, 2002).

In addition, the time required to create social capital also varies. Fukuyama (1995) mentioned that social capital's roots are buried in centuries of cultural evolution. Others, on the contrary, asserted that it does not take a long time to create social capital. Thus it would be possible to form social capital in a short time (Brown and Ashman 1996). According to Brown and Ashman (1996), social capital created in a short time was necessary to support political and economic development.

Level of social capital

Social capital has been dealt with at the level of the individual, the informal social group, the formal organization, the community, the ethnic group and even the nation (Coleman 1988; Portes 1998; Putnam 1995). This view toward the level of social capital represents that social capital can be dealt with at all levels: individual, group, community and nation. However, in some other authors' investigations, the span of social capital is limited and should be limited to an individual or community level. Brewer (2003) asserted that although social capital is originally conceived as a community-wide concept, it should be observable at the individual level. Then, Coleman argued that social capital is not an attribute of individuals but a context-dependent aspect of social structure (Robinson 2000). Glaeser, Laibson et al (2002) asserted that post-Coleman literature has viewed social capital as a community-level attribute.

Although there are various views toward the level of social capital, the general idea common in most literature is that social capital is evident at any level (individual, group, community or nation), if there is a sense of belonging and identification between individuals or groups. Thus the level of social capital can be classified into 3 types: micro-level (individual), meso-level (group) and macro-level (societal).

Empirical studies

Although it is very hard to clarify social capital's definition and its measurement, the concept of social capital has been used in many disciplines. It reflects the fact that many researchers, urban planners, and policy makers still have an interest in the concept of social capital. In this sense, there have been constant efforts to confirm that social capital has been playing an important role in enhancing sustainable community development. Through many empirical studies done by researchers, it is possible to find the role and benefits of social capital regarding community development. For example, Robert Putnam's empirical test regarding social capital was related to the local government's role in a community because he has political science background. His study found that the areas with low social capital were ruled by the most unsuccessful governments. On the other hand, the areas with high levels of social capital were ruled by more successful governments. His study and the result of his analysis show that the status of social capital could be used as an indicator to reveal the degree of success of the administration in each area studied. Robert Putnam's research is a good example of explaining the role of social capital in terms of local government administration.

Health

The relationship between health and social capital is often one of the big issues studied, resulting in many researchers trying to analyze the relationship. One study (Veenstra, G, 2000) investigated the relationships between micro level (individual level) social capital (trust, commitment and identity in the social-psychological dimension; participation in clubs and associations and civic participation in the action dimension) and health status. The data were collected by mail survey in Saskatchewan, Canada. The total number of respondents was 534 and the response rate was about 40%. The reason for the high response rate is related to repeated encouragement through post cards. The author controlled for human capital effects using socio-economic variables such as income and education. According to the statistical results of the empirical test conducted by Gerry Veenstra (2000), the frequency of socialization with work-mates, willingness to turn to a work-mate in a time of trouble, and attendance at religious services were significantly related to better health among respondents. After controlling for human capital variables (income and education), socialization with work-mates and attendance at religious services were still related to health significantly. However, willingness to turn to work-mates was not related to health significantly. Additionally, individual level of commitment in pursuit of happiness, individual level of trust in various communities of people, individual level of identification with different communities, and individual level of commitment to the communities were not related to health status. Civic participation was also unrelated to health. Only commitment to pursuing happiness had any relationship with health. This empirical test indicates an interesting result. It is quite different from what this writer expected. Only small parts of social capital have a weak relationship to health. However, there are also many articles to represent that social capital has significant relationship with health status as well.

Crime and Economy

There is much evidence to expect that the areas with high levels of social capital have lower crime rates than areas with low levels of social capital (Sampson et al. 1997). As a matter of fact, a high level of social capital is not the only factor making a society a safer area. The study by Sampson et al (1997) controlled for individual-level characteristics, measurement error, and prior violence. They found that collective efficacy (mutual trust and neighborly altruism) yields a high level of interaction between neighborhoods and also acts to reduce crime. The empirical test was conducted through survey data. The number of respondents was 8782 and survey areas were 343 neighborhoods in Chicago, Illinois.

Kawachi et al. (1997) also suggested that key factors in the relationship between violent crime, social distrust and inequality are low self-esteem, low dignity and lesser social status. Where self-esteem, dignity and social status are undermined by poverty and exclusion, trust and social ties are undermined with negative consequences in terms of ill-health and crime. After controlling for poverty and other factors that might encourage criminal behavior, U.S. evidence shows that communities characterized by 1) anonymity and limited acquaintance among residents; 2) unsupervised teenage peer groups; and 3) low levels of local civic participation, face an increased risk of crime and violence (Sampson, 1995).

Halpern (1999) notes that social capital is closely associated with economic issues.

Fukuyama illustrates that social capital in the economic sphere reduces transaction costs between people because mutual trust, reputation, and informal sanctions can take the place of contracts (legal system needs) and formal sanctions (Halpern. 1999). And wealthier nations (as measured by GDP per capita) are associated with higher level of social capital, which means social capital is closely related to economic growth.

Education and Political engagement

Education is closely connected with social capital. Education helps to create social capital and educational achievement is an important outcome of social capital. These observations were identified by Putnam (2000) and Halpern (1999).

Coleman emphasized the importance of a surrounding community of adults for young people who are with the adults (Coleman, 1988). Coleman argued that education achievement can be supported by social capital through many types of supportive relations among adults who are parents of the children. According to Coleman, the types of support are related to homework assistance, out-of-school activities, direct parental involvement in school activities, and support for families and children in difficulty.

In addition, evidence of the impact of social capital on education in United States is reviewed by Putnam (2000a). He found that there is a strong and significant correlation between social capital and learning outcomes. The measurement of social capital used is made up of several indicators: 1) intensity of involvement in community; 2) public engagement (e.g., voting); 3) community volunteering; 4) informal sociability (e.g., visiting friends); and 5) trust level. Learning outcomes were measured by SAT (Standard Aptitude Test) scores. In his investigation, several variables which are not proper for the statistical analysis were controlled: race, level of income, income inequality, levels of educational completion in the adult population, poverty rates, educational spending, teachers' salaries, class size, family structure, religious affiliation, and the size of the private-school sector. The empirical test indicated that high levels of social capital have an impact on learning outcomes measured through the SAT scores. Also, informal sociability (e.g., visiting friend's house) and trust level were found to be more significant factors than other factors.

Additionally, civic participation is highly correlated with political engagement (van Deth. 2001). Putnam found that increases in average education levels increased levels of trust, and did not reduce political participation levels. The level of completed education is one of the predictors of political engagement. The person with the ability to read and to write can have more chances than the illiterate person to participate in several community activities including political engagement.

Policy Implication

Some people might think that social capital theory can be applied in many disciplines and can give us solutions for social problems shared in a community.

However, Woolcock (2001) strongly emphasizes that social capital is not a panacea. Although social capital is not a panacea, social capital theory is a good foundation to address social problems because of its relationship to social issues: economic growth, crime, health and education. Also, Healy, T., & Côté, S (2001) suggest that specific types of social capital (e.g. bridging, bonding, linking) are important for making policies to address social problems.

There are some examples of using the concept of social capital for making policies: Center for Educational Research and Innovation (OECD), 2001, the well-being of nations (the role of human and social capital). In Pistoia, Italy, the municipal government supports poor families in the community by providing meeting places. In these meeting places, various activities occur: children have after-school activities (including extracurricular lectures), and residents use the meeting place for community conferences. This policy of providing meeting places for poor families is based on volunteering and community self help concepts. In addition, daycare programs are managed in these meeting places for poor families. Volunteers from their community are taking care of children (teaching) and babies (baby-sitting). Residents in the community autonomously discuss shared problems in the common meeting place. This example shows that the concept of social capital (e.g., volunteering and community self help concept) should be considered when a municipal government is making a policy.

CHAPTER 3: DESCRIPTION OF THE STUDY AREAS AND NEIGHBORHOOD CHARACTERISTICS

Geographical Units for Analysis

Two geographical units for analysis which are a Census block and a Census block group are used in this dissertation research. According to the U.S. Census Bureau (Katy Rossiter, Geographer, US Census Bureau), block groups are the next level above census blocks in the geographic hierarchy. They are statistical divisions of census tracts. Generally, there are between 600 and 3,000 people in a block group. The block group is the smallest geographic entity for which the decennial census tabulates and publishes sample data (U.S. Census Bureau).

Census blocks are defined as “statistical areas bounded by visible features such as roads, streams, and railroad tracks, and by nonvisible boundaries such as property lines, city, township, school district, county limits and short line-of-sight extensions of roads.” In fact, they are the smallest unit of Census enumeration and reports. In a city, census blocks are bounded on all sides by streets. However, in some rural areas, Census blocks may be large and irregular because they are bounded by a variety of features such as streams, roads, and transmission lines.

Initially, it is necessary to identify whether the level of social capital is related to the condition of dwelling structure and environment at the block group-level. While controlling for the impact of neighborhood characteristics on the dependent variable, the impact of social capital on the condition of dwelling structure and environment (i.e., dependent variable) is first identified mesogeographically. Neighborhood characteristics, the level of social capital, and the condition of dwelling structure and environment are collected at the level of block group. Once the impact of social capital on the condition of dwelling structure and environment is identified through block group-level analysis, there is another analysis using a Census block as the geographical unit for analysis. The purpose of the block-level analysis is to find out influential social capital indicators closely associated with the condition of dwelling structure and environment microgeographically through data regarding social capital and the condition of dwelling structure and environment collected at the block level.

Study Area Sampling

According to the standard hierarchy of census geographic entities, the Census block is the smallest entity. The second smallest entity is the block group. About 50 % of parcels within a block and about 50 % of blocks within a block group are randomly selected to collect the data on social capital and the condition of dwelling structure and environment from selected sample blocks and block groups.

With regard to the number of blocks and block groups, generally speaking, the larger the sample size, the higher the statistical power of an analysis. However, it is somewhat difficult to have a very large sample size (i.e., blocks and block groups) because it involves costs in terms of time and effort. For example, it takes about one hour for one block to be surveyed. There are usually 10 to 15 houses within a Census block. Likewise, a small sample size is also problematic because small samples do not allow for reliable statistical analysis. Small sample size makes it difficult to study a statistical population and its characteristics. Thus establishing an optimal number of Census blocks and block groups to be studied for this dissertation research is very important. In order to determine optimal sample size, two methods are devised.

First, it is possible to figure out the optimal sample size through some computations. Probability level, Effect size, and Statistical power are the components used in the computations. As is well known, the optimal sample size will be different depending on the kind of statistical analysis used. The statistical analysis used in the dissertation research is multiple regression analysis. To study the impact of social capital on the condition of dwelling structure and environment (i.e., managing dwelling structure and environment) is the main objective of statistical analysis. In this case, the number of predictors in independent variable sets (main factor set and control factor set) is relevant to determine the optimal sample size.

$$\hat{Y} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5$$

Figure 3. The model of multiple regression

From Figure 3, for example, suppose that the anticipated effect size is 0.4, desired statistical power level is equal to 0.80, the number of predictors is 4, and probability level is 0.1 for a-priori sample size calculator for multiple regression (http://www.danielsoper.com/statcalc3/calc.aspx?id=16#). After the necessary parameter values are entered, the “A-priori sample size calculator for multiple regression” will inform minimum required sample size which is 29.

The second method for calculating optimal sample size is to use a statistical program (i.e., SPSS Sample Power 3.0). It will easily identify the appropriate sample size in minutes. The program gives us chance to test the possible results before we begin our research (Sources: http://www-03.ibm.com/software/products/us/en/spss-samplepower). However, if the size of a population for analysis is not that large, the number of samples could be obtained through the following equation.

$$n = \frac{z^2_{\alpha/2} \times 0.5^2}{(S.E)^2 + z^2_{\alpha/2}(0.5)^2 / N}$$

Figure 4. The equation to obtain sample size for a small population

N: The number of a population is

S.E: sampling error

*Note. confidence level (90%) - $Z_{\alpha/2}$=1.645, confidence level (95%) - $Z_{\alpha/2}$=1.96, confidence level (99%) - $Z_{\alpha/2}$=2.54.

*Source: Chapter 3. Sampling methods, Page 46
(Department of Statistics, Hannam University. http://wolfpack.hnu.ac.kr)

Based on the size of a population, confidence level, and sampling error, Table 10 shows appropriate sample sizes estimated through the equation in Figure 4.

The number of Population (N)	The number of samples					
	95% Confidence Level			99% Confidence Level		
	±3% Sampling Error	±5% Sampling Error	±10% Sampling Error	±3% Sampling Error	±5% Sampling Error	±10% Sampling Error
500	250	218	81	250	250	125
1,000	500	278	88	500	399	143
1,500	624	306	91	750	460	150
2,000	696	323	92	959	498	154
3,000	788	341	94	1,142	544	158
5,000	880	357	95	1,347	586	161
10,000	965	370	96	1,556	622	164
20,000	1,014	377	96	1,687	642	165
50,000	1,045	382	96	1,777	655	166
100,000	1,058	383	96	1,809	659	166

Table 10. Appropriate sample size based on population size, confidence level, and sampling error

*Source: Chapter 3. Sampling methods, Page 47
(Department of Statistics, Hannam University. http://wolfpack.hnu.ac.kr)

As an optimal sample size of Census block group is calculated through a computation, thirty block groups are selected as study areas based on specific criteria. The specific criteria for choosing study areas will be discussed in the next section. There are a total of 653 Census blocks in the 30 Census block groups. The 653 blocks are comprised of 12,016 parcels. As pointed out in Table 10, if the size of a population is fewer than 1,000 (confidence level (95 %) and sampling error (±3 %)), the number of samples could be 50 % of the number of the population. For example, if the number of a population is 1,000, 500 samples observations may be enough to be used for estimating a population’s characteristics and tendencies. In other words, at least 50 % of parcels in a block and 50 % of blocks in a block group will be randomly selected and surveyed in order to establish representative values for each block and block group.

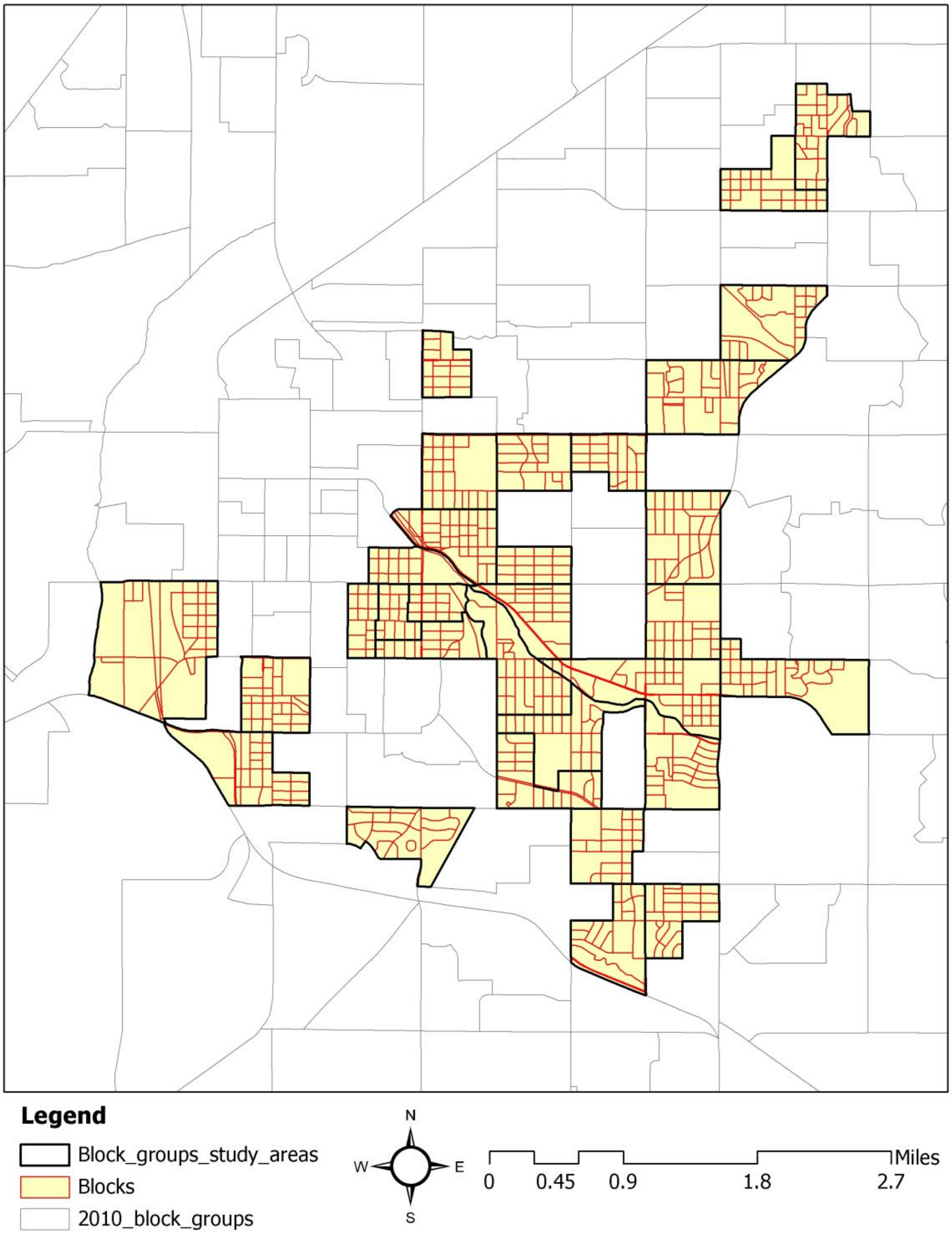


Figure 5. Study areas (randomly selected parcels and blocks)

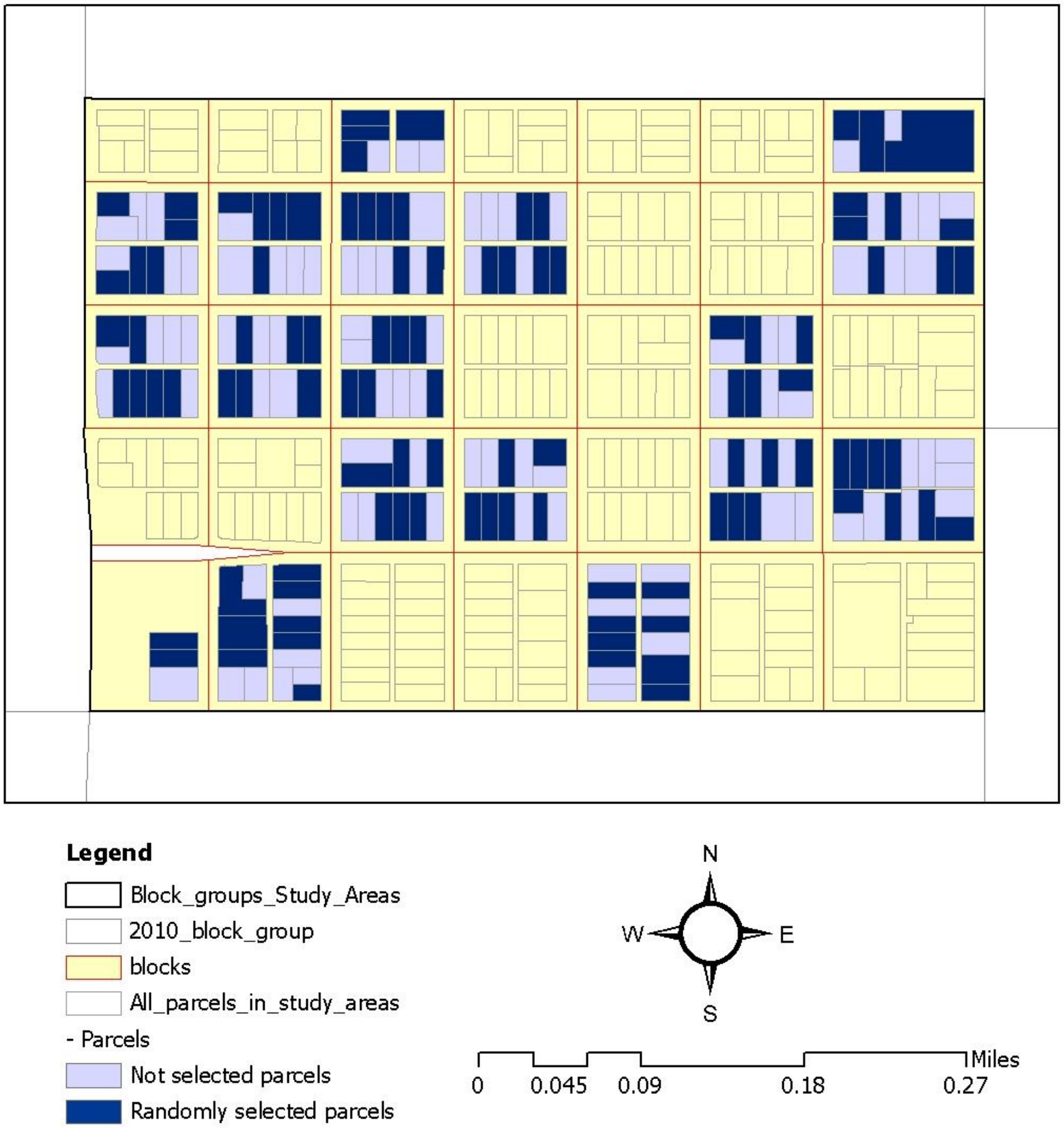


Figure 6. Study areas (randomly selected parcels and blocks)_2

The criteria to select those 30 Census block groups for the study area are socio-economic status which is considered as neighborhood characteristics. A total of 201 Census block groups in Lancaster County are classified based on socio-economic status which is neighborhood characteristics. Among 201 block groups, some of them having similar neighborhood characteristics (i.e., socio-economic status) are used as study areas because it is necessary to control other factors' influences on the dependent variable which is the condition of dwelling structure and environment. As mentioned earlier, the main theme of this dissertation research is to find the impact of social capital on the condition of dwelling structure and environment, not the impact of neighborhood characteristics.

In order to ascertain the socio-economic status of each block group, a total of seven neighborhood characteristics including median home value, median household income, median built year, and crowding of household are considered. And also education attainment rate, unemployment rate, and population below poverty level are included for cross-validation.

The selected 30 block groups were chosen to have approximately the same levels of neighborhood characteristics. Each neighborhood characteristic is classified into five levels, which have equal intervals. For example, in the case of education attainment (the percent of people who are older than 25 years old with education higher than college level), there are five classes. Table 11 shows the five classes used for classifying block groups in terms of education attainment rate.

Education Attainment Rate	
Class 1)	0.00 % < x < 17.8244 %
Class 2)	17.8245 % < x < 24.2424 %
Class 3)	24.2425 % < x < 32.0988 %
Class 4)	32.0989 % < x < 44.5719 %
Class 5)	44.5720 % < x < 77.7429 %

Table 11. Five classes of education attainment

(The percent of people who are older than 25 years old with education higher than college level)

Criteria (Neighborhood characteristics) for selecting study areas

The purpose of this classification is largely to divide block groups in the Lancaster County into five classes for each neighborhood characteristic. Thus, based on each neighborhood characteristic, all block groups (201 block groups) in Lancaster County will be classified seven times into five classes because there are seven criteria used in my dissertation research. Thus, there are seven sets of block groups which are classified into five classes differently. Among the five classes, second lowest class, third lowest class, and fourth lowest class are chosen in each division by neighborhood characteristics. And then seven sets of classified block groups are overlaid to find intersected block groups among seven sets of classified block groups, which is to identify study areas (i.e., Census block groups). Those identified thirty Census block groups are expected to have similar socio-economic status. Of course, they may have different levels of social capital.

Education attainment

There are 201 block groups in Lancaster County, in which each has different education attainment rates. The education attainment rate is expressed as the percent of people who are older than 25 years old who have obtained a level of education which is higher than college level.

Generally, socio-economic status is measured as a combination of education, income, wealth, housing, and occupation (American Psychological Association http://www.apa.org/pi/ses/resources/publications/factsheet-education.aspx). In particular, education attainment rate is one of the neighborhood characteristics associated with overall socio-economic status. Thus, it is possible to know roughly a community's socio-economic status through observing education attainment rates.

There are many references regarding the relationship between socio-economic status and education achievement (i.e., academic achievement). Many different types of indicators have been used to identify the relationship between socio-economic status and education achievement. Educational achievement or academic achievement are represented by language skills, letter recognition, phonological awareness, reading difficulties, mathematics, dropout rate, and so on. However, in this dissertation research, academic achievement is expressed through the data of educational attainment rate which is obtained from the 2000 U.S. Census. A problem is that the boundaries of the 2010 Census block groups are different from the boundaries of the 2000 Census block groups. Thus, we obtained a total of 201 block groups' values from 2000 Census block groups' values regarding educational attainment rates. When selecting thirty block groups, only identical block groups having the same boundaries between two Census block groups are chosen as study areas in order to avoid a re-sampling issue. The following Table 12 shows five classes for educational attainment rates and the number of block groups for each class.

Education Attainment Rate	The number of block groups
1) 0.00 % < x < 17.8244 %	38
2) 17.8245 % < x < 24.2424 %	**37**
3) 24.2425 % < x < 32.0988 %	**37**
4) 32.0989 % < x < 44.5719 %	**37**
5) 44.5720 % < x < 77.7429 %	37

Table 12. Five classes of educational attainment

* Total number of block groups in the Lancaster County 2000 = 186

Block groups within the lowest and highest classes are expected to have abnormal levels of educational attainment when compared to block groups in the three middle classes. When including variables with extreme and abnormal values of educational attainment rate in a statistical analysis, it may not allow for reliable statistical analysis because it would be difficult to identify the impact of only social capital. Controlling for other factors except for social capital variables is important for this reason. Thus, block groups in the three middle classes are chosen for study. Their educational attainment rates are more than 17.8245 % and less than 44.5719 %. The number of block groups in the three classes is 111 which is 3/5 of the total number of block groups in the Lancaster County. Figure 7 shows the locations of chosen block groups and their educational attainment rates.

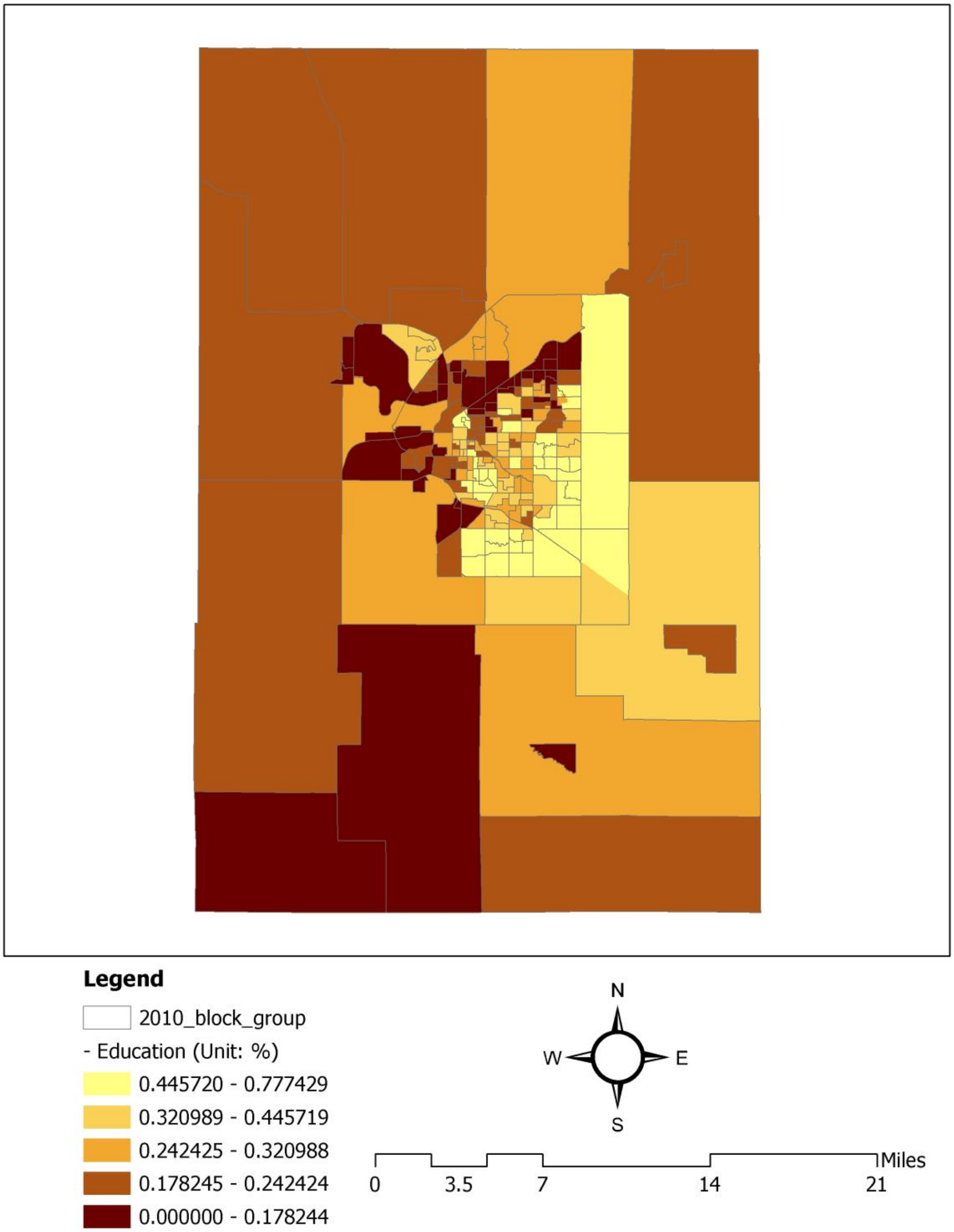


Figure 7. The locations of chosen block groups and their educational attainment rates (Source: 2000 U.S. Census data)

According to Figure 7, educational attainment rates in south-east areas are higher than other areas of Lancaster County. Block groups with low educational attainment rates are located in north-west areas. Where the color of block groups is darker, the educational attainment rate is lower. The same number of block groups are included in each class because the data (i.e., block groups in the Lancaster County) are divided into five equal-sized data subsets, or five quantiles.

Median Home Value

Median home value is very closely associated with the socio-economic status of a community because it reflects householders' income. In order to provide a little enlightenment about choosing study areas, median home value is examined in this section. The data of median home value is obtained from 2010 American Community Survey. All block groups in Lancaster County have their own representative values in terms of median home value. And, they are grouped into five classes based on the representative values of each block group. In the same manner as used with educational attainment rates, the same number of block groups is assigned to each class because of a five quantile method.

The five classifications for median home value and the number of block groups for each class are as follows.

Median Home Value	The number of block groups
1) $ 167,201 < x < $ 360,900	40
2) $ 137,401 < x < $ 167,200	**40**
3) $ 117,901 < x < $ 137,400	**40**
4) $ 94,601 < x < $ 117,900	**40**
5) $ 0 < x < $ 94,600	41

Table 13. Five classes of median home value
* Total number of block groups in the Lancaster County 2010 = 201

The range of median home value for the three middle classes is between $ 94,601 and $ 167,200. And there are 120 block groups belonging to the three middle classes. They account for about 60 % of all block groups in Lancaster County. As mentioned earlier, the reason some block groups within the second, third, and fourth lowest classes are chosen is that extreme cases (the lowest and highest classes representing the groups with the smallest median home values and largest median home values) are excluded as outliers in a statistical model. Figure 8 shows the locations of selected block groups which belong to the three middle classes in terms of median home value.

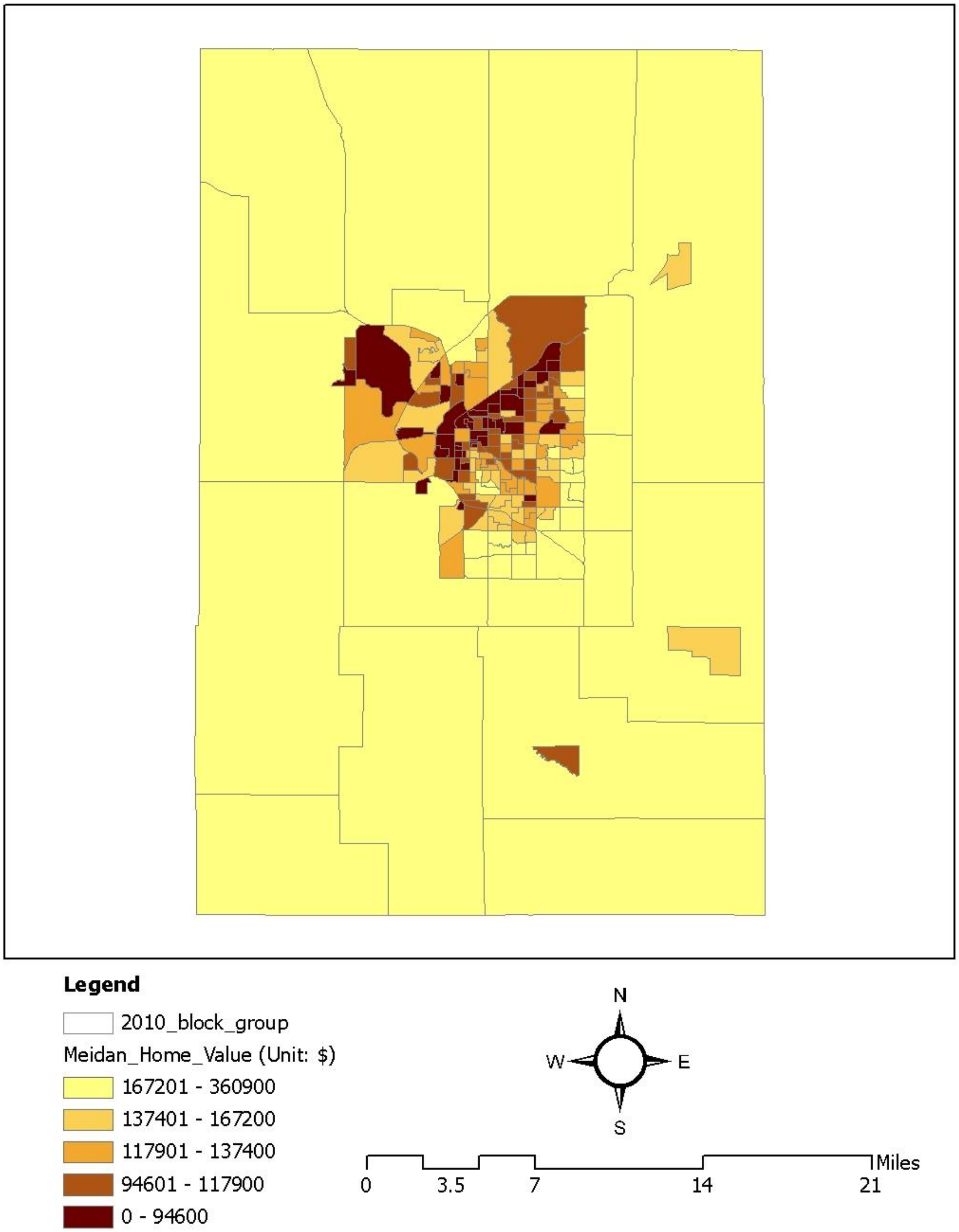


Figure 8. The locations of chosen block groups regarding median home value,

(Source: 2010 American Community Survey)

The figure shows that some houses with higher median home values are located in suburban areas. Their median home values are from $ 167,201 to $ 360,900. However, some block groups have lower median home values, even though they are far from the center of a city. This is attributed to the existence of several small towns within Lancaster County; Waverly, Bennet, and Hickman. Median home values of the houses in the block groups within the boundary of the city of Lincoln usually are a little lower than the median home values of houses in suburban areas.

The block groups located in the north-western areas of the city are a drab color (i.e., dark brown) since houses in these block groups have lower median home values. The block groups in the south-eastern areas of the city are brightly colored, with light colors such as yellow or beige. These house median values are higher than the house median values in the other areas.

Median Household Income

Households are different from families. A family consists of two or more people who are related to each other, such as children, husband, wife, grand parent, etc. They are residing in the same housing unit. And, there should be one householder in a family. However, households could be one or multiple depending on the number of people who are not related to each other such as by birth, marriage, etc occupying a house. If, for example, there are a total of six people living together in a housing unit in which there is one family and two single men. One family consists of four members: father, mother, and two children. In this case, therefore, there are three households in the house.

Median household income is also different from mean household income. The mean is an average in which total value of incomes is divided by the number of households. The median is the middle value in a set of data which are sorted into ascending order. In some cases, there are even numbers of values in a set. Then the average of the two middle numbers would be the median value of the set of data.

Median household income and mean household income are different measures of central tendency, but it is not simple to determine which one will best be used for household income data. Generally, it depends on the distribution of household income. The mean is the income to use with symmetrically distributed data which are not skewed. Median is better used for data which are not symmetrically distributed.

More people earn low incomes than high incomes in part because a fairly large proportion of the population works part-time in the United States. This implies that the income data are not symmetrically distributed. As mentioned earlier, median is the middle value of a set of data, 50 % of values are above the median value, and the other 50 % of values are below the median value. In this sense, when the data are not symmetrically distributed, the median is the one to be pretended to indicate the general tendency of the data.

As is well known, median household income is a direct indicator representing the economic condition of a community. However, it does not mean that the indicator of median household income can summarize the economic condition of a community exactly and on the whole. The combination of several indicators such as income, median home value, and occupation could summarize the economic status more precisely. Median household income is one of them, so that it could allow us to measure general economic tendency. The data of median household income is obtained from U.S. Census

(2010 American Community Survey).

According to the five classes of median household income, all block groups in the Lancaster County are classified into five groups. Table 14 and Figure 9 show five classes for median household income and the distributions of classified block groups in terms of median household income.

Median Household Income	The number of block groups
1) \$ 0 < x < \$ 29,586	41
2) \$ 29,587 < x < \$ 41,500	**40**
3) \$ 41,501 < x < \$ 54,146	**40**
4) \$ 54,147 < x < \$ 71,793	**40**
5) \$ 71,794 < x < \$ 129,250	40

Table 14. Five classes of median household income

* Total number of block groups in the Lancaster County 2010 = 201

In the same manner, block groups within the three middle classes are selected. The range of three middle classes regarding median household income is from \$ 29,587 to \$ 71,793. And according to the five quantile method used to classify block groups into five classes, 120 block groups in the Lancaster County are selected to narrow down the study areas for a survey. Figure 9 below shows how the chosen block groups are located in the Lancaster County.

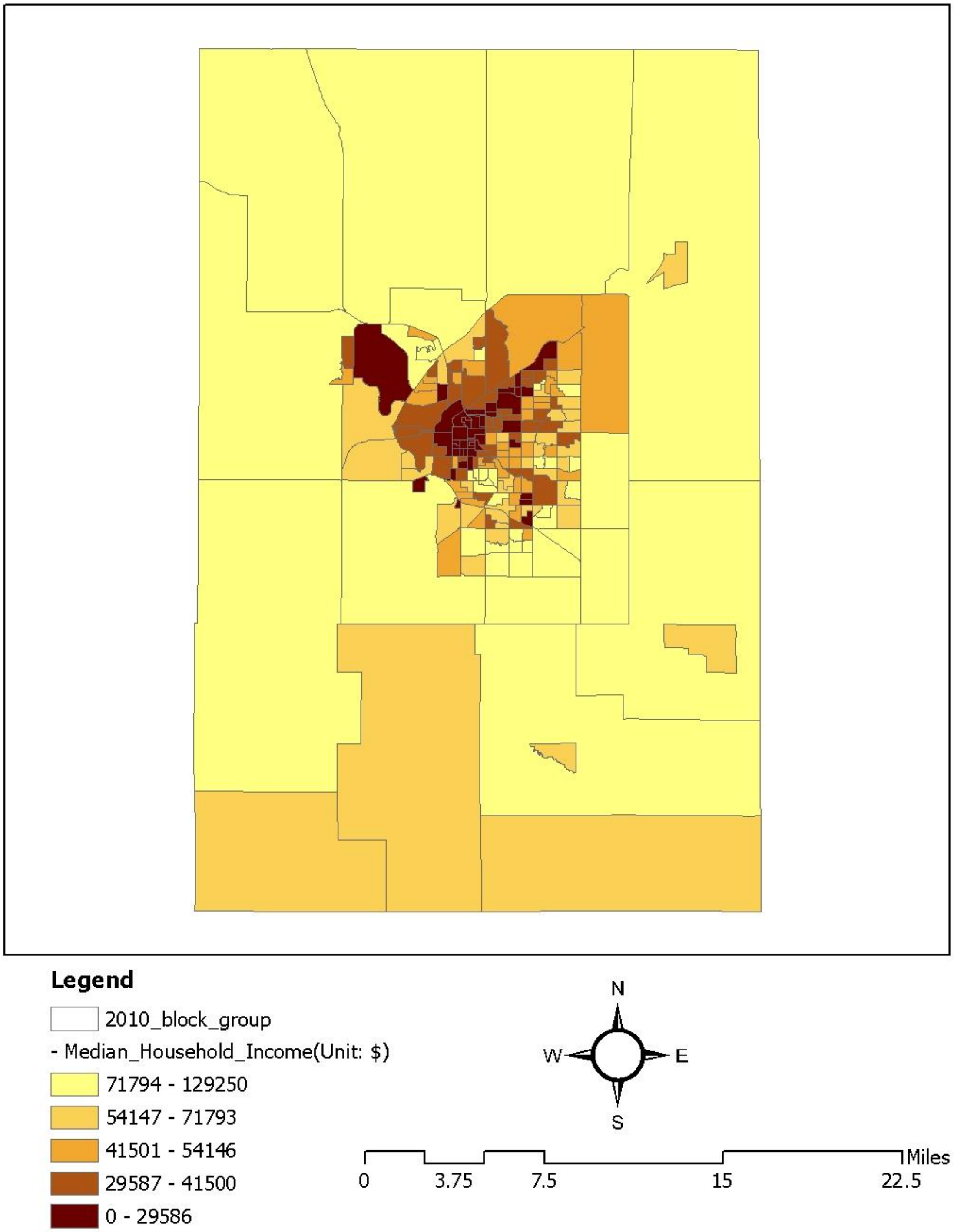


Figure 9. The locations of selected block groups regarding median household income (Source: 2010 American Community Survey)

According to Figure 9, generally block groups near the outer city boundary have higher median household incomes, which are between $ 71,794 and $ 129,250. Likewise, within the city boundary, the block groups in the north-western parts of the city have lower median household incomes. In contrast, the block groups in the south-eastern parts of the city have higher median household incomes. This tendency for high income values in south-eastern parts and low income values in north-western parts is shown in most sub areas.

Median Year Structure Built

The indicator of median year residential structures were built is also used to measure the socio-economic status of a community. With regard to housing, median year of construction is considered as a very important indicator to show socio-economic status, along with the indicator of crowded households. According to social science and government data services (Census of Population and Housing, 1990: Subject Summary Tape File (SSTF) 5), data on year structure built refer to when the building was first constructed. Even though some structures were remodeled and converted, the year when a building was first constructed is used. In the cases of mobile homes (trailer) or houseboats, the manufacturer's model year of those housing units are regarded as the year a structure was built. The median year structures were built is the middle value in a set of "years structures built," which are sorted into ascending order. If there are even numbers of values in a set, the average of the two middle years would be the median year structure built for a Census block group. The data of the median year structures were built for a Census block group is obtained from U.S. Census (2010 American Community Survey)

In some previous studies, median age of housing has been used. The median age of housing is acquired by subtracting median year structure built from 2013 (year of study). Then the calculated difference will be the median age of housing. For example, if the median year structure built in a block group is 1990. The median age of housing in the block group is “23” which is calculated by 2013 minus 1990.

The below Table 15 and Figure 10 shows five classes for median year structure built and the distributions of block groups based on each class.

Median Year Structure Built	The number of block groups
1) x = 0	8
2) 1939 < x < 1943	**51**
3) 1944 < x < 1963	**49**
4) 1964 < x < 1980	**48**
5) 1981 < x < 2005	45

Table 15. Five classes of median year structure built

* Total number of block groups in the Lancaster County 2010 = 201

The total number of block groups in the Lancaster County is 201. Among them, about 150 block groups are selected to determine study areas. Their range of median year structure built is from 1939 to 1980. In Table 15, there are eight block groups whose median year structure built is “0.” It is not clear why the median year structure built of eight block groups is “0.” It might be related to unknown construction date or missing data value. If there is no way to know when buildings are constructed, median year structure built might be considered as an unknown data value. The block groups with unknown construction dated buildings could be expressed by “0.” Another reason may be related to existence of buildings in a block group. For example, in some block groups which are further from the city of Lincoln, there are no buildings or housing. Thus they are regarded as no-data block groups.

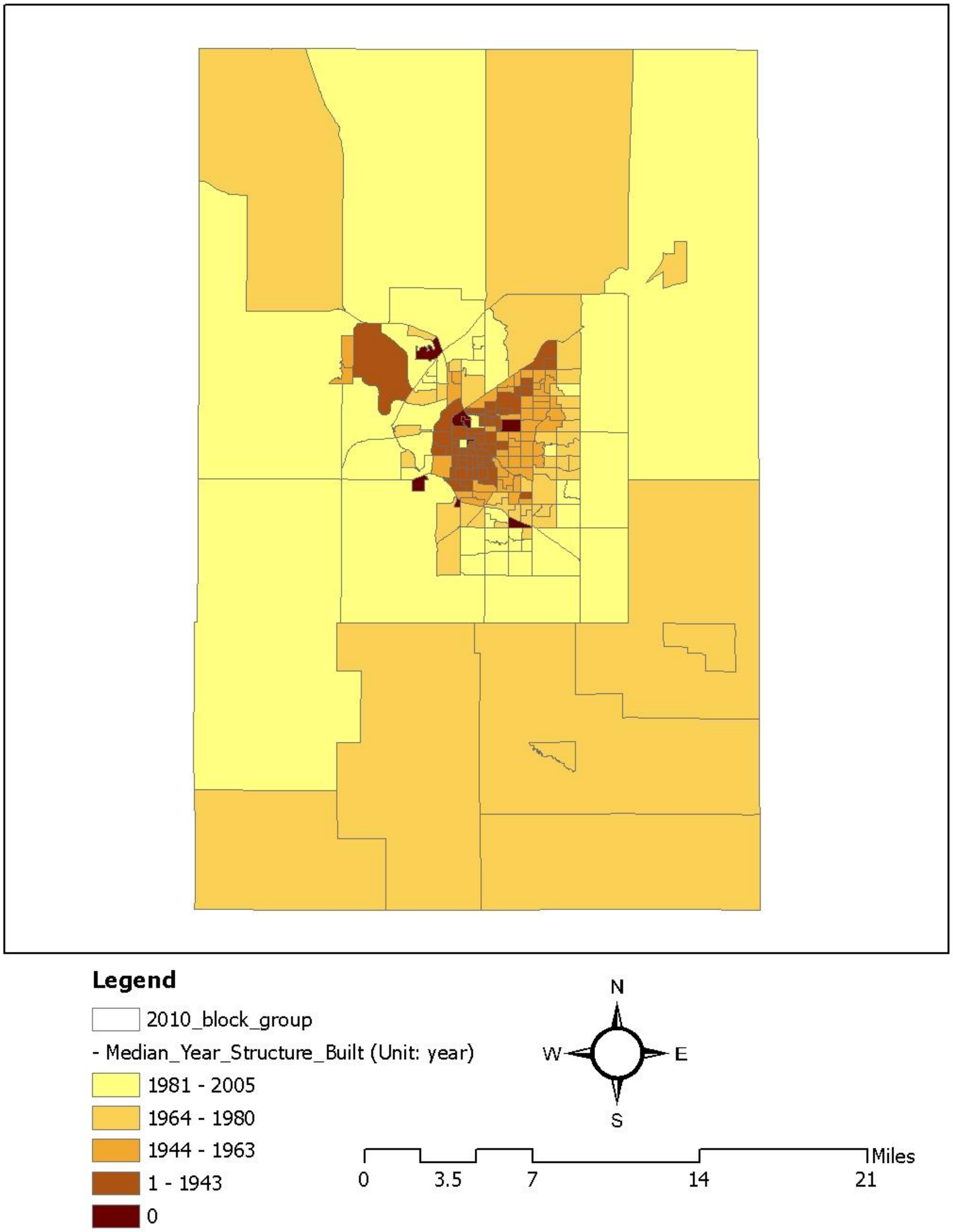


Figure 10. The locations of selected block groups based on three classes of median year structure built (Source: 2010 American Community Survey)

Household crowding

The indicator of household crowding usually is related to household wealth. Lower income people usually have smaller houses. They have more people per room than wealthier people who have larger houses. According to a 2010 Social Report from the Ministry of Social Development in New Zealand (http://socialreport.msd.govt.nz/), “unemployed people are more likely to be living in crowded households than people with full-time jobs.” The report indicates that the percentage of unemployed people who are living in crowded households is approximately 20 %. However, the percentage of people with full-time jobs living in crowded households was found to be just 7 %. The level of crowded households is measured by the percentage of households containing one or more people per room.

Some authors (Evans, G.W. (2003), Baker, M., McNicholas, A., Garrett, N., Jones, N., Stewart, J., Koberstein, V. and Lennon, D. (2000)) have studied the correlation between household crowding and other factors such as poor educational attainment, the prevalence of certain infectious diseases, psychological stress and so on. Based on their research, enough housing space to meet each family member’s needs or desires is very important to achieve a better quality of life. Therefore it is concluded that crowding is a core component of a better quality of life. Table 16 below shows the five classes of household crowding based on 2010 American Community Survey.

Household Crowding	The number of block groups
1) x = 0.00 %	65
2) 0.0001 % < x < 1.5915 %	**34**
3) 1.5916 % < x < 3.0252 %	**34**
4) 3.0253 % < x < 5.7007 %	**34**
5) 5.7008 % < x < 21.5859 %	34

Table 16. Five classes of household crowding (2010 American Community Survey)

* Total number of block groups in the Lancaster County 2010 = 201

Block groups within the three middle classes are selected. The range of three middle classes regarding household crowding which is measured by the percentage of households containing one or more people per room is from 0.0001 % to 5.7007 %. And according to the five quantile method used to classify block groups into five classes, 102 block groups in Lancaster County are selected to narrow down the study areas for a survey. Figure 11 below shows how the chosen block groups are located in Lancaster County.

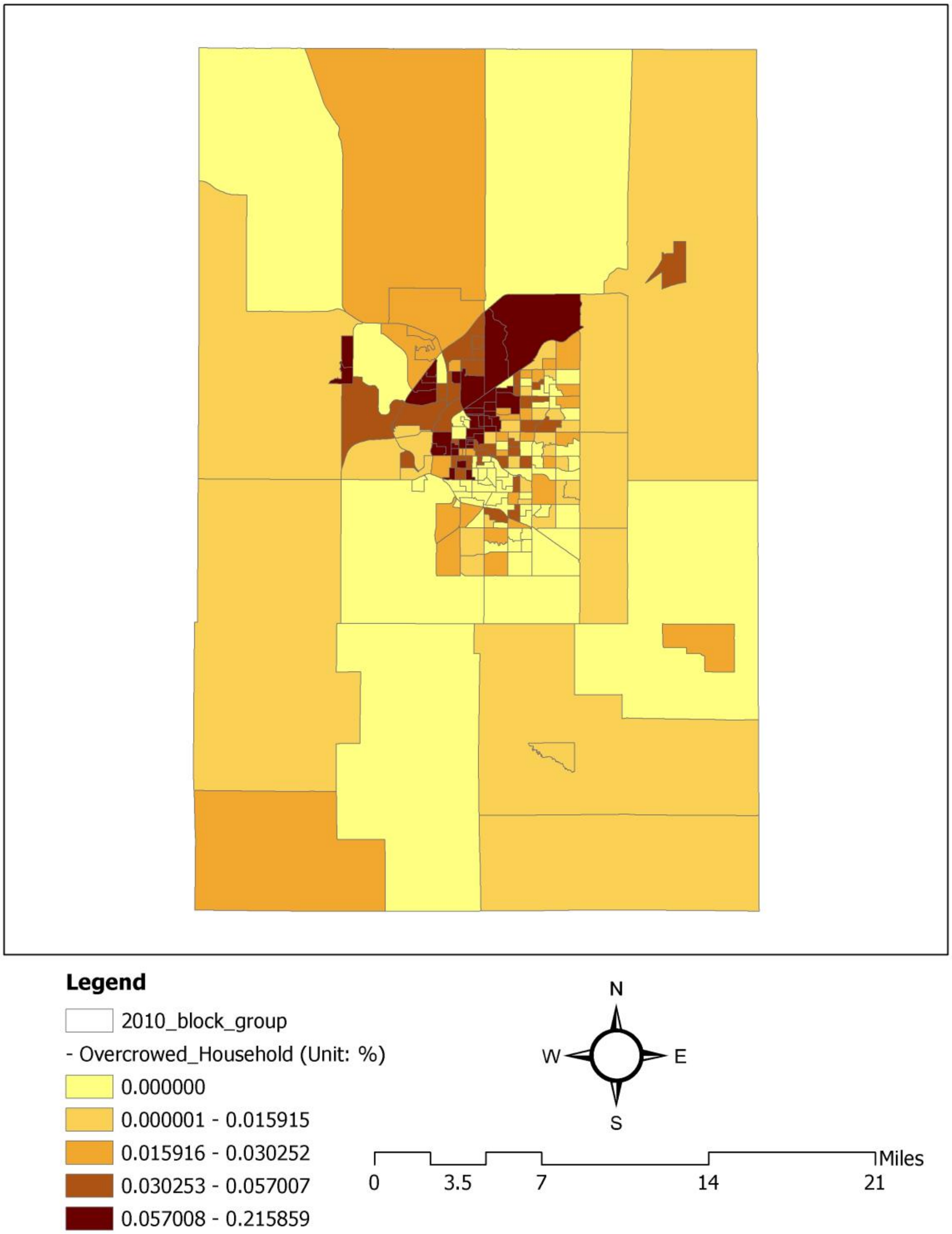


Figure 11. The locations of block groups based on each class of household crowding (Source: 2010 American Community Survey)

Poverty level

As is well known, the economic statuses of all block groups in the Lancaster County are different because each block groups is different in various aspects. Like median home value, below poverty level is a very important indicator to measure a block group's economic condition.

Below poverty level is a direct indicator to describe economic status of a community. The Census Bureau uses a series of thresholds based on family size and composition to determine who is in poverty. If a family's total income is less than the family's poverty threshold, the family and all family members are considered in poverty (U.S. Census Bureau). According to the Office of the Assistant Secretary for Planning and Evaluation, the poverty threshold is updated every year by the U.S. Census Bureau. The poverty thresholds do not vary geographically, which means all states and cities have the same poverty thresholds. However, the thresholds are updated for inflation measured through the Consumer Price Index (CPI-U) (U.S. Census Bureau, *How the Census Bureau Measures Poverty*). And the official poverty threshold includes only income before taxes, so that it does not include capital gains or non-cash benefits. If, for example, a family has five members: grand-father, father, mother, and two children who earn money and, say the father's income is \$ 12,000, mother's income is \$ 8,000, and grandfather's income for the year of 2011 is \$ 8,000, then the family's total income in 2011 is \$ 28,000. The official poverty threshold in 2011 was \$ 27,517. In order to determine whether the family is in poverty or not, these values are compared. If family's total income is greater than the official poverty threshold, then the family is not in poverty. The family's total income is divided by the official poverty threshold to yield "ratio of income to poverty."

In this dissertation research, population below poverty level is expressed by the percent of people below poverty level in the past 12 months (U.S. Census Bureau, 2007 American Community Survey). Based on the below poverty level values of block groups in Lancaster County, the block groups are classified into five classes. Among these five classes (groups), the block groups in the lowest class (i.e., below poverty level is the highest) show that the economic conditions are not as good as other block groups. However, the block groups in the highest class, which means below poverty level is the lowest, have good economic condition relatively. In other words, the percentage of families or people who are in poverty is low. The data of below poverty level is obtained from U.S. Census 2000. Table 17 describes the five classes for below poverty level and the number of block groups by the classes.

Below Poverty Level	The number of block groups
1) 0.00 % < x < 2.1292 %	38
2) 2.1293 % < x < 5.5319 %	**37**
3) 5.5320 % < x < 9.8107 %	**37**
4) 9.8108 % < x < 18.5144 %	**37**
5) 18.5145 % < x < 100.00 %	37

Table 17. Five classes of below poverty level

* Total number of block groups in the Lancaster County 2000 = 186

Actually, there are no Census data regarding below poverty level in 2010. Thus, 2000 U.S. Census data of below poverty level are used. Like with the data of educational attainment rates, the problem is that the boundaries of 2010 Census block groups are different from the boundaries of 2000 Census block groups. Thus, we obtained a total of 201 block groups' values from 2000 Census block groups' values regarding below poverty level. When selecting thirty block groups as study areas, only identical block groups having the same boundaries between two Census block groups are chosen as study areas in order to avoid the re-sampling issue. This is the procedure of cross-validation to identify the validity of randomly chosen thirty block groups.

The range of below poverty level for the block groups in the three middle classes is between 2.1293 % and 18.5144 %. And, the number of block groups within the range of the below poverty level is 111. The three middle classes account for approximately 60 % of all block groups in Lancaster County. Figure 12 shows the locations of block groups regarding the below poverty level measure.

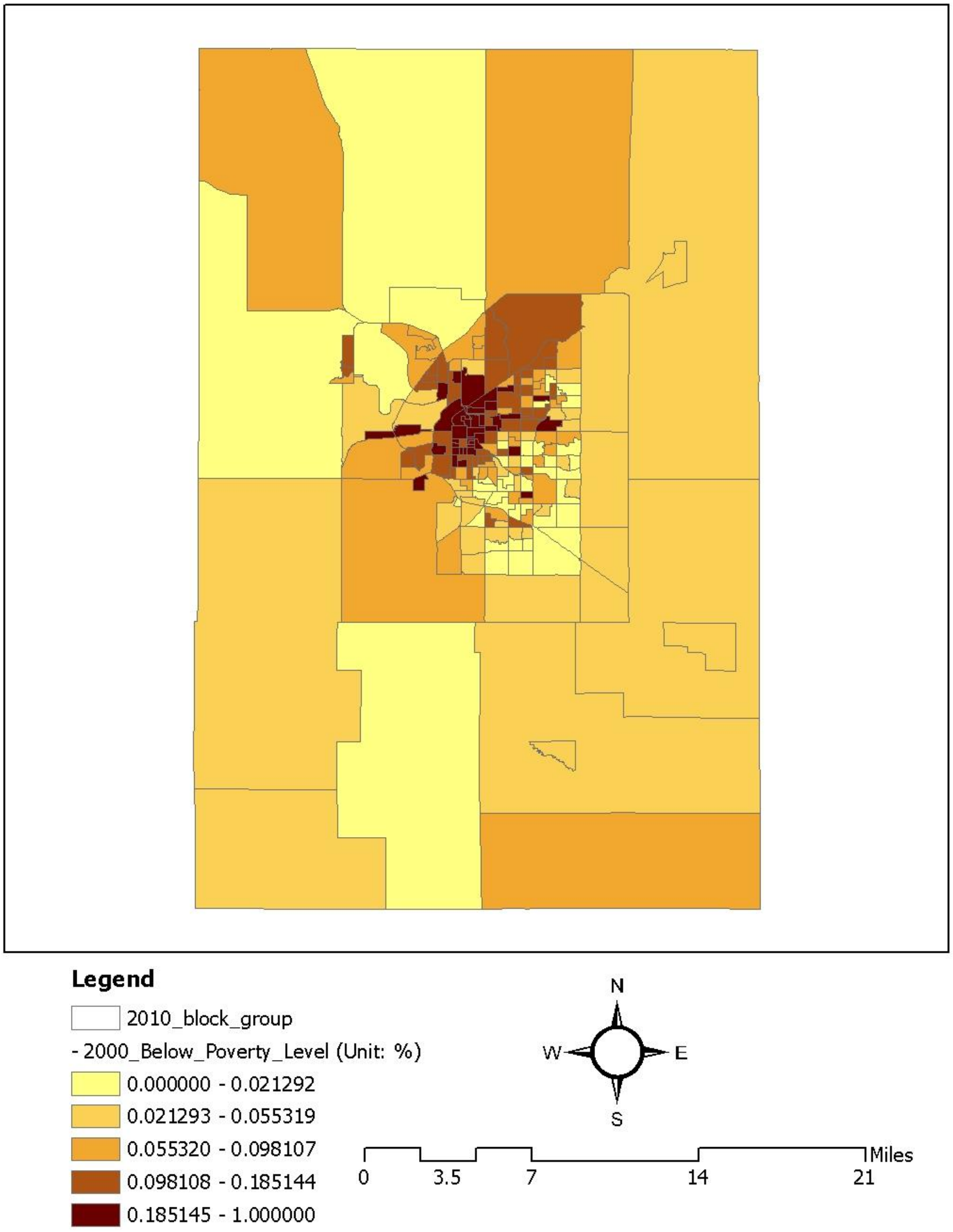


Figure 12. The locations of block groups regarding below poverty level
(Source: 2000 U.S. Census data)

According to Figure 12, more dark color block groups are in the north-western parts of the city compared to south-eastern parts of the city. The below poverty level of the block groups in the north-western parts within the city is higher than 17 %. In contrast, the block groups in the south-eastern parts within the city have less than 2% of below poverty level. This shows that families' total incomes are higher in the south-eastern parts within the city.

Unemployment Rate

There are no Census data on unemployment rates at a block group level in 2010. Thus, 2000 Census data on unemployment rates instead of 2010 Census data are used to determine study areas. Problematically, the numbers of block groups in the two Census years (2000 Census vs. 2010 Census) are different. One hundred eighty six block groups are indicated in the 2000 Census data. There are 15 more block groups shown in the 2010 Census data. This makes it difficult to overlay maps showing each factor, such as median household income, median home value, median year structure built, etc.

In the process of determining study areas, unemployment rate, below poverty level, and educational attainment rates from 2000 Census data are used to randomly select thirty block groups from fifty nine selected block groups which intersect each other among maps of four other factors including median home value, median built year, median household income, and crowding of household from 2010 Census data.

Unemployment rate is represented by the percentage of people aged 16 years or older in the civilian labor force who were unemployed in 1999. Civilian labor force includes adult U.S. residents who are not in the active-duty military. Among the civilian labor force, unemployed people are classed by three types. First, if all civilians 16 years old and over who were not at work during the reference week, they are classified into unemployed people. Even if some people might have an occasional job, if they did not work during the reference week, they were considered unemployed people. The second type is people who were looking for a job during the previous 4 weeks. They are also categorized into the unemployed labor force. Lastly, some people had been laid off so that they also were looking for a new job or waiting to be called back to a job. In these situations, they are all considered unemployed people.

The unemployment rate is a very direct and closely studied indicator to show the socio-economic status of a community. Table 18 below shows the five classes of unemployment rate.

Unemployment Rate	The number of block groups
1) 0.00 % < x < 0.6772 %	38
2) 0.6773 % < x < 1.4825 %	**37**
3) 1.4826 % < x < 2.4643 %	**37**
4) 2.4644 % < x < 3.9416 %	**37**
5) 3.9417 % < x < 25.8573 %	37

Table 18. Five classes of unemployment rate (2000 Census data)

* Total number of block groups in the Lancaster County 2000 = 186

In the next section, there will be discussion of how the indicator of unemployment rate is used to select randomly thirty block groups from among fifty nine selected block groups which intersect each other among four maps of other factors. Thus, the thirty block groups' unemployment rates should be in the specific range from 0.6773 % to 3.9416 %. The total number of block groups in the Lancaster County in 2000 Census data is 186, which is 15 block groups fewer than in the 2010 Census data. According to Figure 13, the locations of block groups based on each class of unemployment rate show the block group pattern. Block groups in the north-western part of Lancaster County have higher unemployment rates. In contrast, block groups with lower unemployment rate are located in the south-eastern part of Lancaster County.

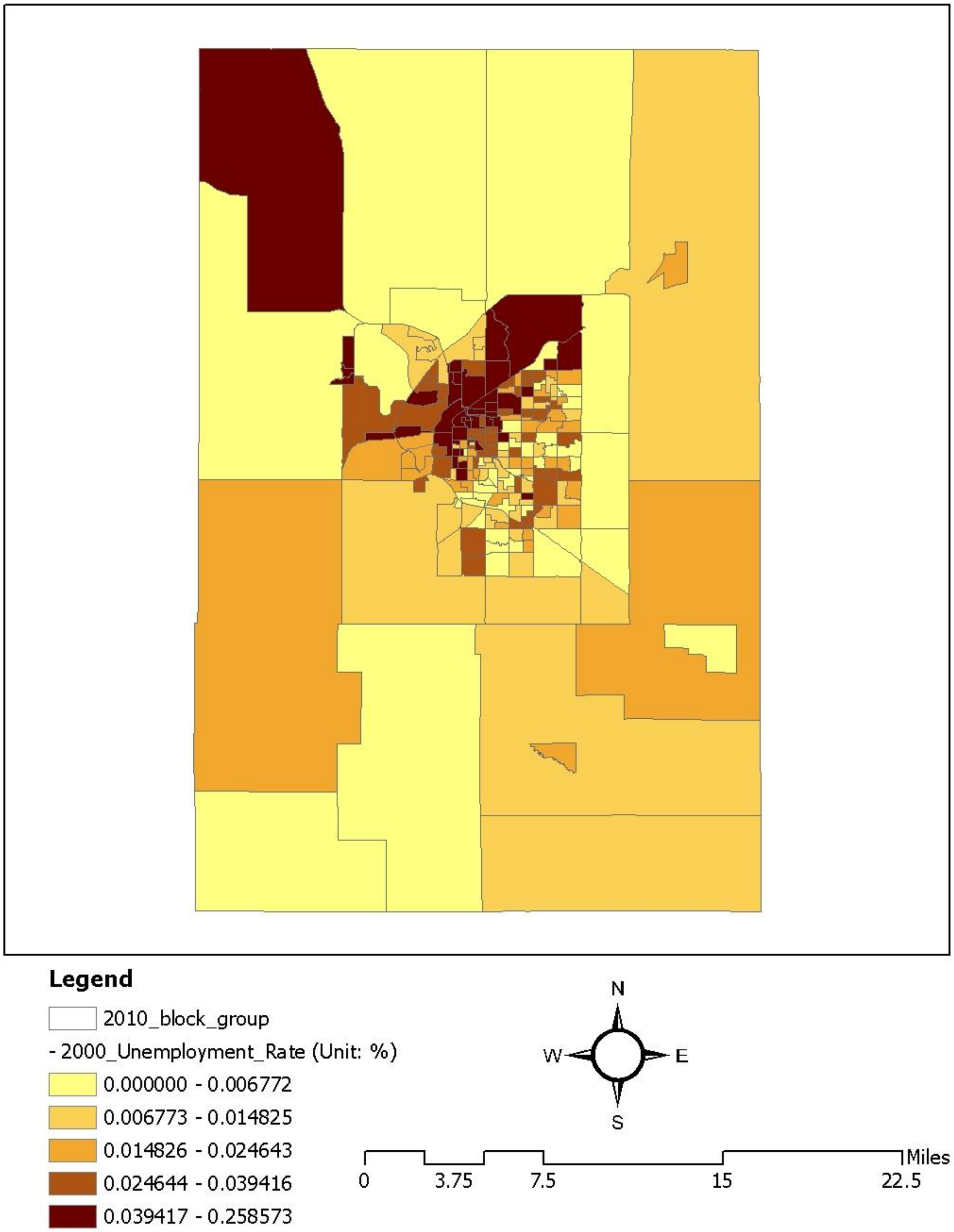


Figure 13. The locations of block groups based on each class of unemployment rate (Source: 2000 U.S. Census data)

Final Study Areas

Generally, in order to represent the socio-economic status of a community, five categories of indicators are discussed: 1) occupation (unemployment rate); 2) income (below poverty level, median household income); 3) wealth (median home value); 4) education (high education attainment); 5) housing (median built year, household crowding). Among these indicators, some indicators such as educational attainment rates, unemployment rate, below poverty level, are not available for the 2010 Census year because the data on these indicators was not in existence at a block group level for 2010. Also extreme outliers and unmatched block group boundaries make it difficult to determine study areas using both 2000 and 2010 Census data.

Determined first was fifty nine intersected block groups from among the maps of the four other factors obtained from the 2010 Census data: median home value, median built year, median household income, and crowding of household. By comparing the fifty nine intersected block groups with 2000 Census data of three indicators (educational attainment rates, unemployment rate, and below poverty level), block groups having identical boundaries in both 2000 and 2010 Census data are examined. Among the block groups, if they are included in the specific range (three middle classes) of three indicators, they are selected as final study areas.

The four maps (i.e., median household income, median home value, median built year, and crowding of household) representing different aspects of the socio-economic status of block groups in Lancaster County are overlaid to find corresponding block groups. A total of 59 block groups correspond among the four maps. The figure below (Figure 14) shows where the 59 block groups are located in Lancaster County.

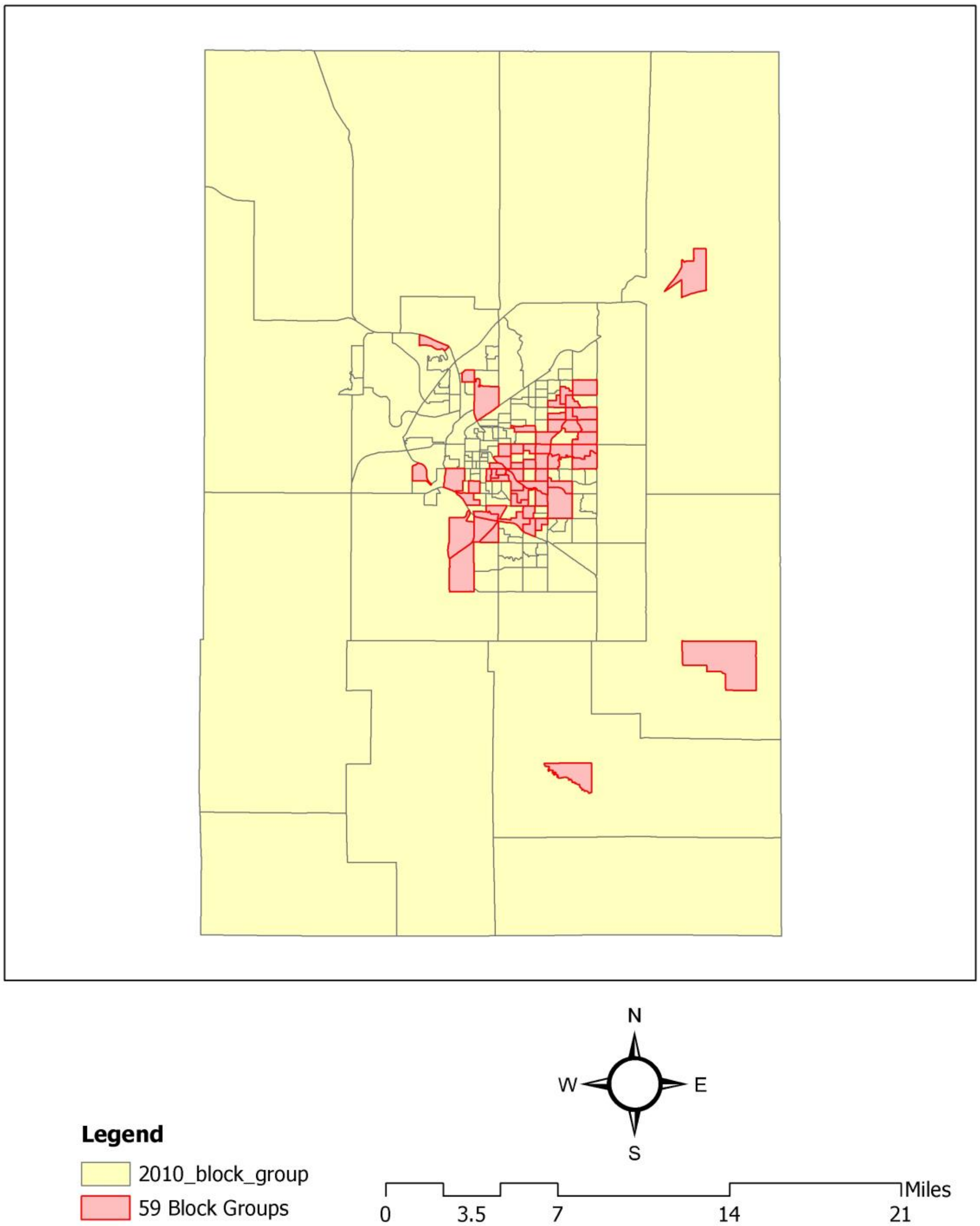


Figure 14. The locations of 59 block groups which correspond among the four maps

Then next investigation is to examine if randomly selected 30 block groups from the 59 block groups are included in the specific range (three middle classes) of other three maps from 2000 Census data: educational attainment rate, unemployment rate, and below poverty level.

In the case of unemployment rate, two block groups among 30 randomly selected block groups are not included in the three middle classes of unemployment rate indicator. Thus, the two block groups are replaced with two other block groups which are included in the three middle classes of unemployment rate indicator.

Figure 15. The investigation for validity of 30 randomly selected block groups from 59 block groups on the data of unemployment rate

The figures below (Figure 16 and 17) show other investigations for validity of 30 randomly selected block groups from the 59 selected block groups on the data of educational attainment rate and below poverty level.

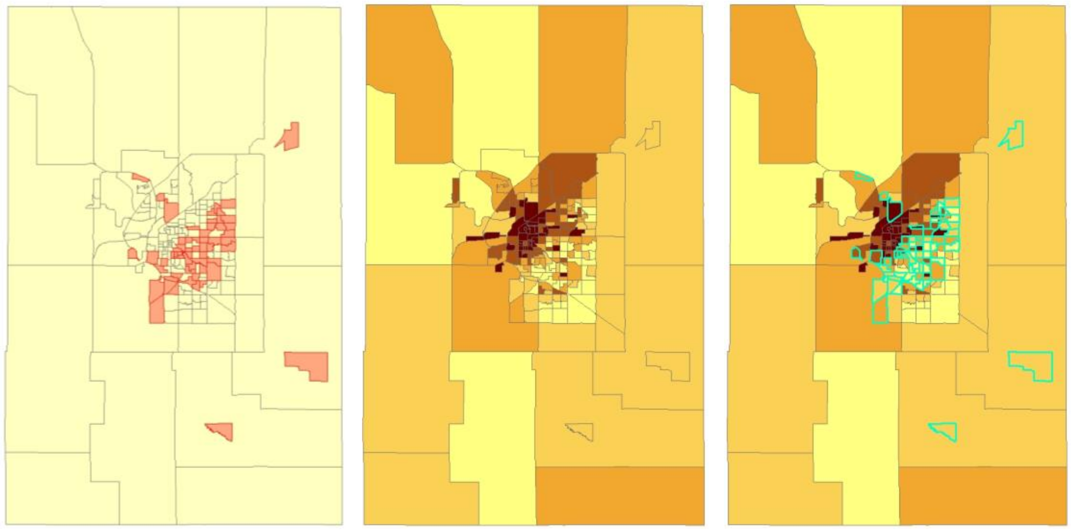


Figure 16. The investigation for validity of 30 randomly selected block groups from 59 block groups on the data of below poverty level

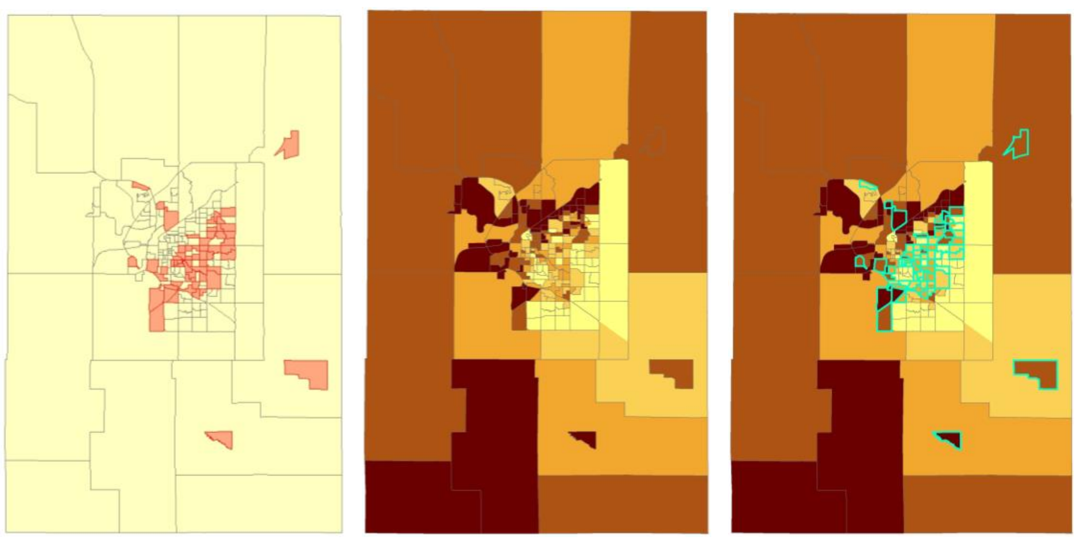


Figure 17. The investigation for validity of 30 randomly selected block groups from 59 block groups on the data of educational attainment rate

CHAPTER 4: DATA AND METHOD

Introduction

Data and its collection are very important in an empirical analysis. Lack of data will make it difficult to proceed with an analysis. Also improperly collected data is one of the obstacles to appropriate research. If the research involves an empirical analysis, it would be much more uncertain. An empirical analysis using improperly collected data cannot appropriately test the hypotheses that authors want to prove in their research. There are two basic geographical units for the empirical analysis in this dissertation research: blocks and block groups. As is well known, data in research should be obtainable and suitable to proceed with an analysis. Block level data of the condition of dwelling structure and dwelling environment (i.e., dependent variable) is obtained by a survey which is called a community scan. The average of each block's value in a block group is used to represent the value of the block group as a whole. Thus we can use block and block group level data on the condition of dwelling structure and dwelling environment for analysis.

However, it is difficult to obtain block level data on the independent variables. Social capital and neighborhood characteristics are the independent variables. In terms of social capital, indicators which are available at the level of the block are used in this dissertation research, including housing price inequality, homeownership rate, voter turnout, ethnic diversity, family status (marriage and own children), social mobility (community attachment), and crime rate. Likewise, it is also possible to get block group level data based on block level data by calculating the block group average. Contrary to the independent variable of social capital, the data on the other independent variable of neighborhood characteristics are not obtainable at the level of the block. Education attainment, median home value, median household income, median year structure built, below poverty level, unemployment rate, and household crowding, which are the independent variables of neighborhood characteristics, are not available at the level of block from the U.S. Census. However, we can get all of the neighborhood characteristic indicators at the level of the block group from the Bureau of Census.

Collecting Data of Dwelling Structure and Environment

Lincoln Community Assessment

Before explaining data collection, the project of “Lincoln Community Assessment” first will be introduced because the main idea for this dissertation research is from this project. We use a device (PDA: HP iPAQ 211) which is used by the project (Lincoln Community Assessment) team for conducting a housing condition survey to know the condition of dwelling structure and environment.

To make a more livable, healthier and more active community, local leaders, including urban planners and policy makers, need to identify community assets and needs. The physical environment of a neighborhood is considered as a community asset significantly affecting the quality of life for residents. According to one community developer working in NeighborWorks (Non-profit organization) in Lincoln, Shawn Ryba, speaking at the Clinton neighborhood meeting for the project of Lincoln Community Assessment (October 25. 2010) said, “the project of Lincoln Community Assessment develops a community assessment framework and tool with which residents of neighborhoods in Lincoln, Nebraska, can collect crucial and otherwise unavailable information on housing conditions and other environmental characteristics for use in improving and strengthening their neighborhoods."

The project team has been working with neighborhood residents. It encourages citizen engagement by involving residents in field-collection of information necessary for neighborhood assessment and for setting appropriate neighborhood improvement goals. The project of Lincoln Community Scan also has enforcement and education purposes to provide proactive tools to residents concerned about some issues such as sanitation (trash, litter, and debris), vacant or dilapidated properties, weeds, graffiti, unregistered or junk vehicles, and exterior housing conditions including roofing, side painting, windows, doors, porches, and gutters.

In the Clinton neighborhood meeting on October 25. 2010, Mr. Ryba also mentioned four objectives of the project. First, the project helps to make a livable neighborhood and to maintain the value of a neighborhood. Second, for the purpose of improving the physical environment of neighborhoods, it helps to collect housing condition data not available otherwise. The third objective of the project is code enforcement and education. The fourth objective is to activate residents engaged in the project by participating in the housing condition survey. Based on these objectives, residents who participate in the project, the community and other residents living in the community, will reap benefits from the project. A well managed physical environment in a neighborhood is not the only benefit gained from the project. Residents and local leaders who are making a decision to improve their neighborhoods also receive benefits, including leadership, understanding building code violation, making some action plans to make neighborhoods better, etc.

Benefits of the project of LCS	
Leadership	Active participation in improving their own neighborhood.
Identification	To help homeowners understand problems and identify resources to make repairs.
Reporting	City code enforcers can use the information in addressing dangerous or unsafe conditions.
Needs Assessment	Help the neighborhood define the breadth of problems; note problem types; decide which can be addressed.
Action Plan	Assist neighborhood in determining neighborhood improvement goals.
Partnership	Create additional home improvement resources for the focus neighborhood.
Data Base	Will provide evidence to support change/improve policy.

Table 19. Benefits of the project of Lincoln Community Assessment
(Sources: NeighborWorks in Lincoln)

In most states, actually, there have been attempts to investigate building code violations through a paper based survey. They are attempting to make a housing stock inventory for use in improving neighborhoods. However, the survey questions used in their paper based surveys are too broad to describe the condition of dwelling structure and environment specifically. According to the previous literature review, paper based surveys conducted in other states do not include some important characteristics of dwelling structure and environment at all. Rather, the data collected in the project of “Lincoln Community Assessment,” are more specific and cover many aspects of dwelling structure and environments. The data is collected by residents and students. They used PDAs in which ArcPad (mobile version of ArcGIS) is installed for collecting housing condition (i.e., the condition of dwelling structure and environment) data. Using ArcPad makes the project more efficient and easier. In terms of data extraction and analyzing, it is even more time-saving.

According to the table (Table 20), survey questions used in the project of Lincoln Community Assessment are quite specific in detail regarding the condition of dwelling structure and environment. There are 30 questions in five categories: house, yard, drive/garage, right of way, and graffiti. The following table (Table 20) shows the categories, various types of building code violations, and answer types, which is the format of the questionnaire for the project of LCS. The next table (Table 21) is the revised one used for the dissertation research. In the revised questionnaire, we classify questions under two large groups: structural and non-structural. House and garage belong to the structural group. Others sections, such as yard, fence, driveway, and sidewalk, are non-structural issues which are related to dwelling environment. The survey reference guide is also derived from the project of Lincoln Community Scan (LCS).

Categories	Types of building code violation	Answers		
House	Premises Identification	No	.	Yes
	Vacant / For Sale	No	For Sale	Vacant
	House paint peeling / Siding damaged	None	Minor	Major
	Missing / Broken gutters, trim, fascia, details	None	Minor	Major
	Broken or boarded windows / Doors	No	.	Yes
	Interior Furniture / Appliances outdoors	No	.	Yes
	Roof	None	Minor	Major
	Porch	None	Minor	Major
Yard	Litter	None	Minor	Major
	Trash Containers / Dumpster	No	.	Yes
	Trash overflowing / Piles	None	Minor	Major
	Empty Alcohol Containers	No	.	Yes
	Drug Paraphernalia	No	.	Yes
	Grass over 6"	No	.	Yes
	Overgrown Weeds / Volunteer Trees	None	Minor	Major
	Yard waste / Brush	None	Minor	Major
	Debris	None	Minor	Major
	Fence broken / Rotting / Leaning	None	Minor	Major
Drive / Garage	Detach. Structure/Garage paint peeling /Siding damaged	None	Minor	Major
	Detach. Structure or Garage windows broken / Boarded	No	.	Yes
	Detached Structure/Roof	None	Minor	Major
	Driveway cracked / Displaced	None	Minor	Major
	Junk Car / Illegally Parked Vehicle	No	.	Yes
	Expired / No License on Vehicle	No	.	Yes
	Private Walkway	None	Minor	Major
Right of way	Sidewalk cracked / Displaced	None	Minor	Major
	Trees Blocking Street Light	No	.	Yes
	Shrubs / Trees on Sidewalk / Street	No	.	Yes
Graffiti	Defacement / Graffiti	No	.	Yes
Rate	Total rate	1	-	10

Table 20. The survey questions used in the project of LCA
(Sources: Lincoln Community Assessment Project, University of Nebraska-Lincoln, Dr. Yunwoo Nam.)

Categories		Types of building code violations	Answers		
Structural	House	Vacant / for sale	No	For sale	Vacant
		House paint peeling	None	Minor	Major
		Structural Problems (siding, foundation)	None	Minor	Major
		Problems in Gutters, fascia, soffits	None	Minor	Major
		Broken doors or windows	No	-	Yes
		Deteriorating roof or chimney	None	Minor	Major
		Deteriorating porch and unnecessary stuffs in the porch	None	Minor	Major
		Graffiti on house	None	Minor	Major
	Garage	Garage structural problems	None	Minor	Major
		Garage paint peeling	None	Minor	Major
		Garage doors or windows broken	No	-	Yes
Non-Structural	Yard / Fence	Litter	None	Minor	Major
		Grass over 10 inches tall	No	-	Yes
		Brush, overgrown weed	None	Minor	Major
		Not managed (not arranged) housing appliances	None	Minor	Major
		Fence broken or leaning	None	Minor	Major
	Driveway / Sidewalk	Driveway cracked / bumps / weeds	None	Minor	Major
		Sidewalk cracked / bumps / weeds	None	Minor	Major
		obstructing sidewalk (overgrown branch, shrub, etc)	None	Minor	Major
Overall Condition		Rate this property (1 = Good condition; 3 = Moderate; 5 = Serious problems)			

Table 21. The revised survey questions used in this dissertation research

The project of Lincoln Community Assessment has five process phases. From Figure 19 below, the first phase is to develop an assessment tool which uses ArcPad in the PDAs (Personal Digital Assistant). In order to program ArcPad, the program of ArcPad Studio 7.1.1 is used to make a framework (setting a survey form in the ArcPad program). And then, in the second phase, residents and students get trained as volunteers. They learn how to use the PDAs and the ArcPad for a survey during training sessions. Also during the training sessions, they obtain information about the project (e.g., purpose, goals, benefits, etc) and building code violations. The next phase is to conduct a survey in a neighborhood. Volunteers go to the assigned areas in a neighborhood and conduct a survey. It usually takes about 1 hour to assess one block in which there are usually 10 to 15 parcels.

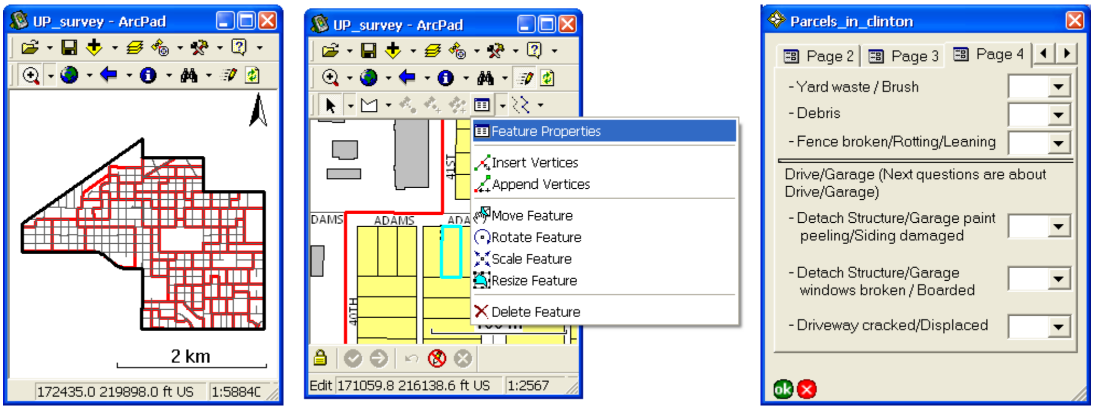


Figure 18. Conducting a survey using PDAs in which ArcPad is programmed
(Sources: Lincoln Community Assessment Project, University of Nebraska-Lincoln, Dr. Yunwoo Nam.)

After completing a survey in all assigned areas, volunteers return the PDAs to the University of Nebraska-Lincoln for the next stage related to analyzing the data. Extracting data from each PDA and analyzing them are in the fourth phase. Finally, local leaders including urban planners, policy makers, and organizations attempt to draw out solutions and action plans for the assessed neighborhood based on the results of data analysis.

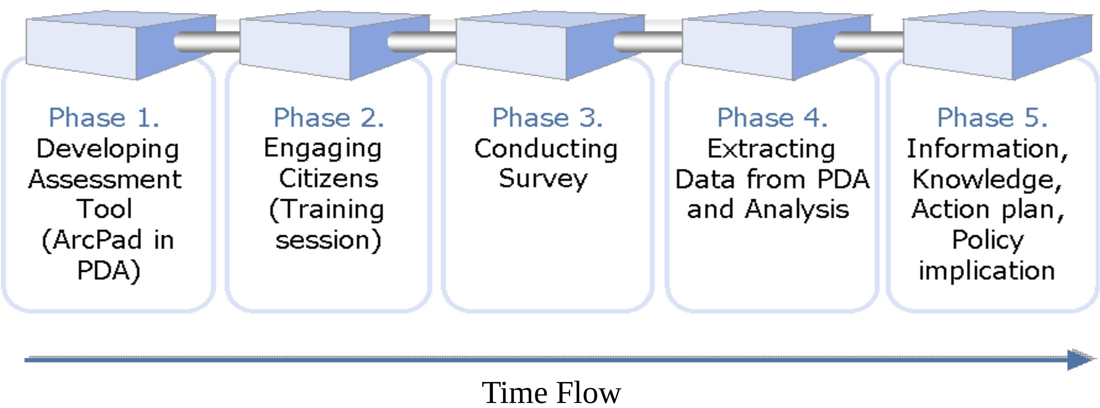


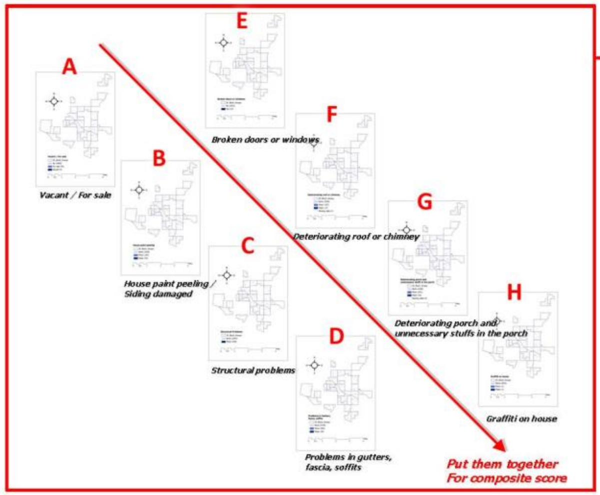
Figure 19. The process of the project (Lincoln Community Assessment)
(Sources: Lincoln Community Assessment Project, University of Nebraska-Lincoln, Dr. Yunwoo Nam.)

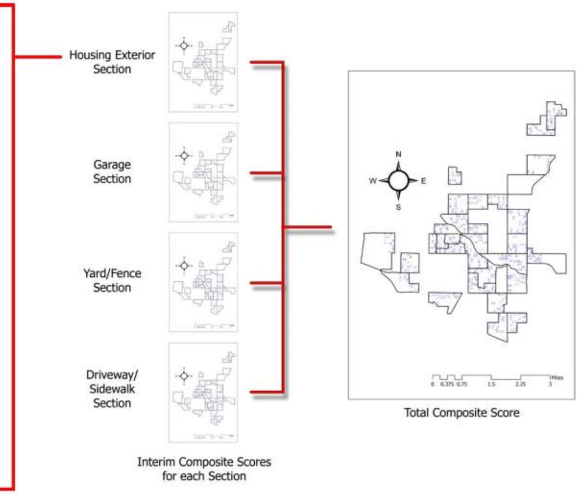
The condition of dwelling structure and environment

I evaluated the condition of dwelling structure and environment of 2655 parcels using a PDA. A total of 20 questions were answered for each parcel. All scans were completed from the sidewalk, and items rated must be visible from the sidewalk. It is not allowed to walk into a private property area for conducting a survey because this scan is just a visual inspection and it is very important not to invade the privacy of people. In order to protect privacy of people, data regarding the condition of dwelling structure and environment of each of the parcels within a block are summarized to obtain a mean value for a block as a whole. That is why all parcel level data on housing condition information are not needed after the calculation of means. Also, all parcels' location information such as longitude, latitude, and housing address are eliminated from the PDA used in the survey and the database for the same reason. Before calculating mean values for each block from parcel level data, I aggregated the parcel level data to obtain interim and total composite scores for each parcel. For the data aggregation, there are three steps: 1) giving evaluation scores to each question, 2) getting interim composite scores for each category, 3) calculating a total composite score for the condition of dwelling structure and environment of one parcel.

Figure 20. Three Steps for aggregating data

Categories			Types of building code violations	Answers			Score
Structural	House	A	Vacant / for sale	No	For sale	Vacant	0
		B	House paint peeling	None	Minor	Major	4
		C	Structural Problems (siding, foundation)	None	Minor	Major	2
		D	Problems in Gutters, fascia, soffits	None	Minor	Major	2
		E	Broken doors or windows	No	-	Yes	4
		F	Deteriorating roof or chimney	None	Minor	Major	3
		G	Deteriorating porch and unnecessary stuffs in the porch	None	Minor	Major	2
		H	Graffiti on house	None	Minor	Major	0
	Garage		Garage structural problems	None	Minor	Major	
			Garage paint peeling	None	Minor	Major	
			Garage doors or windows broken	No	-	Yes	
Non-Structural	Yard / Fence		Litter	None	Minor	Major	
			Grass over 10 inches tall	No	-	Yes	
			Brush, overgrown weed	None	Minor	Major	
			Not managed (not arranged) housing appliances	None	Minor	Major	
			Fence broken or leaning	None	Minor	Major	
	Driveway / Sidewalk		Driveway cracked / bumps / weeds	None	Minor	Major	
			Sidewalk cracked / bumps / weeds	None	Minor	Major	
			obstructing sidewalk (overgrown branch, shrub, etc)	None	Minor	Major	
Overall Condition			Rate this property (1 = Good condition; 3 = Moderate; 5 = Serious problems)				





Step 1. Giving scores to each question

Step 2. Getting interim composite scores for each section

Step 3. Getting total composite score

The first step is giving evaluation scores to each question. For example, if the answer to a question is “Yes,” the score will be “2” or if “No,” “0” respectively. If the answer to another question is “Major,” “Minor,” or “None,” the score will be given as “2” (Major), “1” (Minor), or “0” (None). Thus, based on the answer, appropriate scores will be given to all 20 questions for one parcel.

The next step is to find interim composite scores for each category for a parcel. For example, in order to get an interim composite score for the house category which is one of the structural parts, it is required to combine the scores of eight questions in the house category: 1) vacancy, 2) house paint peeling, 3) structural problems (siding damage, foundation, etc), 4) problems in gutters, fascia, or soffits, 5) broken or boarded windows (doors), 6) deteriorating roof or chimney, 7) deteriorating porch and unnecessary items on the porch, and 8) graffiti on the house.

In a scaling procedure, “Composite Score” is obtained by combining several scores in accordance with a specified formula. The concept of composite score is applied in my dissertation research to measure the condition of dwelling structure and environment. Interim and total composite scores for the condition of dwelling structure and environment of a parcel are calculated by combining scores.

The problem of weighting should be discussed at this point because weighting affects obtaining actual interim and total composite scores. Each question’s weighting relies on each question’s importance and value in terms of the condition of dwelling structure and environment. As a matter of fact, if we consider relative weightings of each question and assign different weightings to each question based on each question’s importance and value, it will help obtain actual and practical composite scores. Also, one can conduct actual statistical analysis using the data of composite scores. However, it is difficult to evaluate the importance of each question in the survey. Deciding whether a specific question is more important and valuable than other questions is not a simple task. Thus, equal amounts of weighting are assigned to each question in this dissertation research. However, In the project of Lincoln Community Assessment, researchers are trying to assign different weightings based on each question's importance and value. They conducted mail surveys. Recipients for the mail survey are experts who participated and involved in the project. Based on their answers, it could be possible to ascertain each question's importance and value.

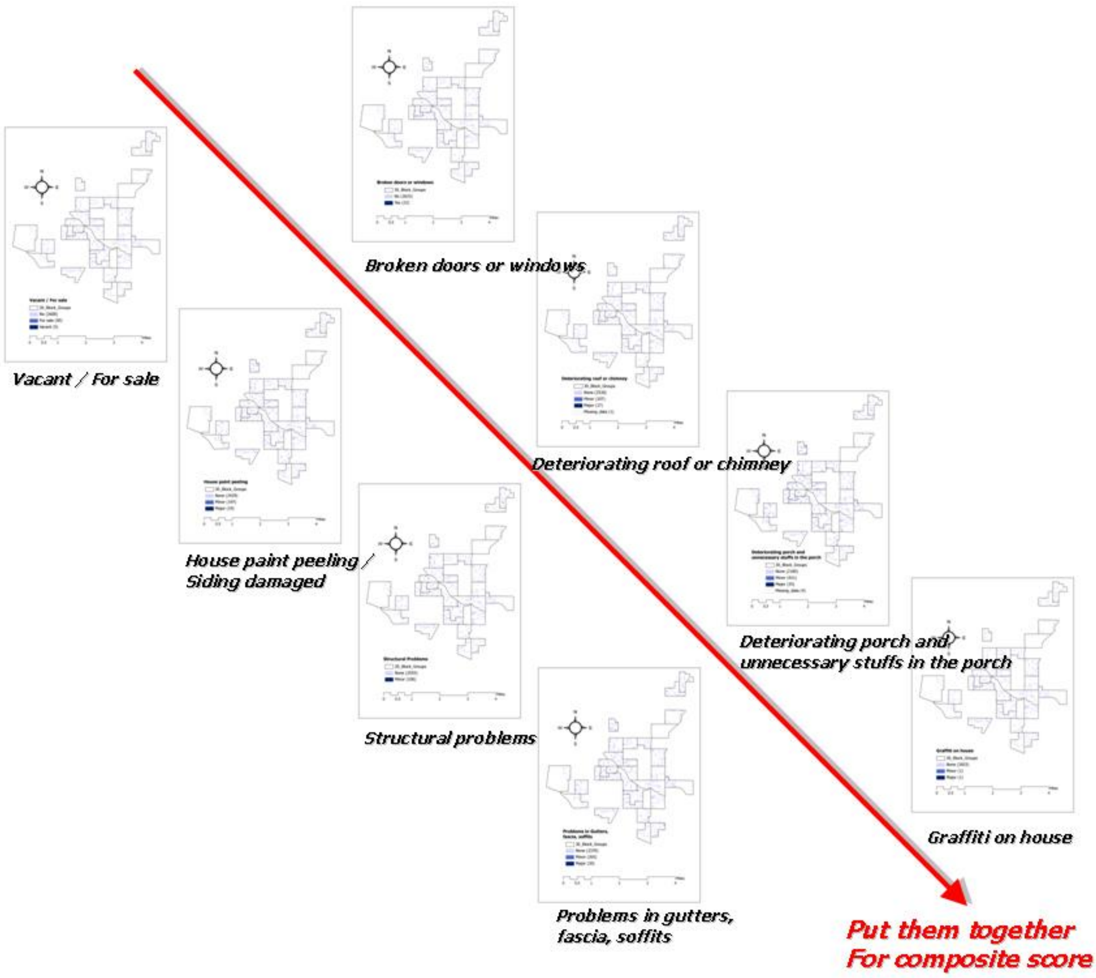


Figure 21. The process to obtain interim composite scores of parcels
for the house category (housing exterior section)

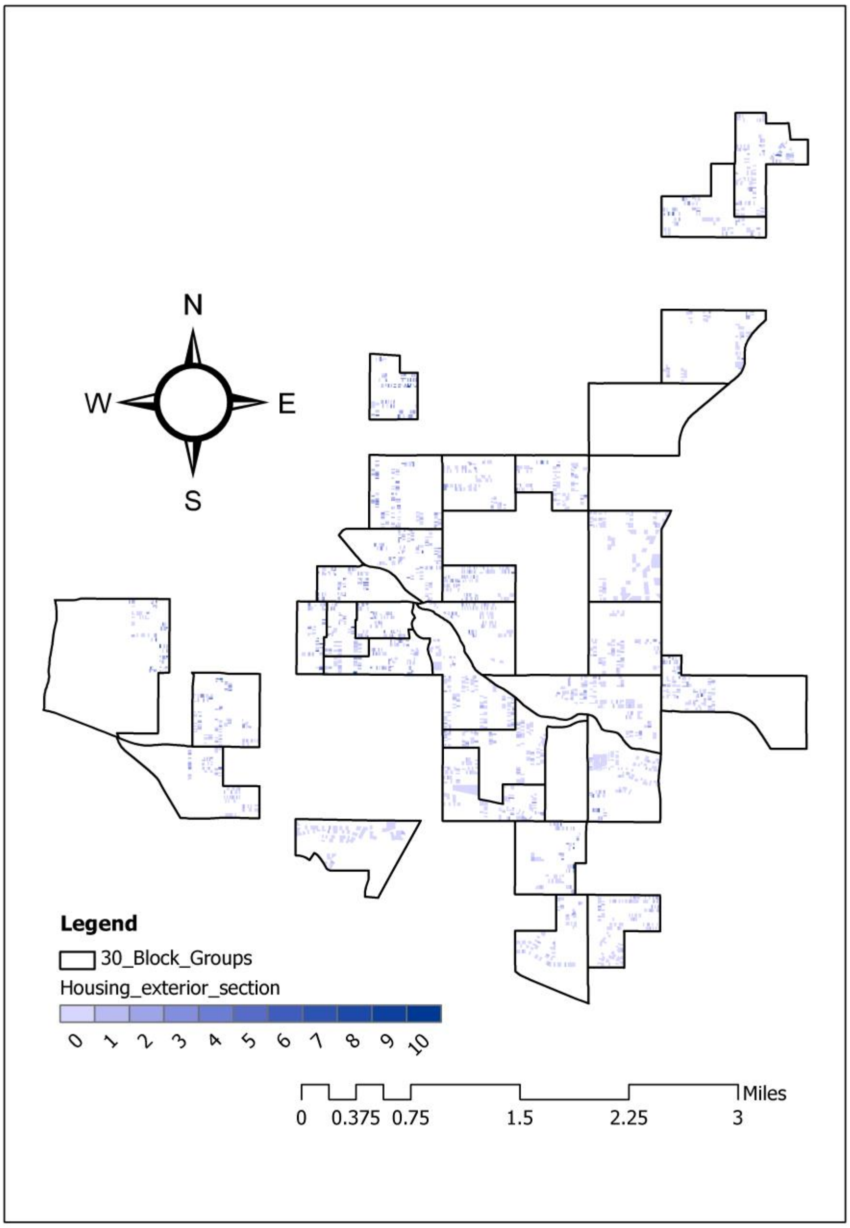


Figure 22. The map for interim composite scores of parcels for housing exterior section

The last step (step 3) in the data aggregation is to calculate a total composite score for a parcel. Based on the previous two steps, there must be four interim composite scores for a parcel from four categories: house, garage, yard and fence, driveway and sidewalk. Then, it is quite simple to calculate the total composite score for one parcel by combining the four interim composite scores through a raster calculator. Likewise, we do not know which category is more important and valuable than other categories, so that each interim composite score will have an equal amount of weighting for the same reason.

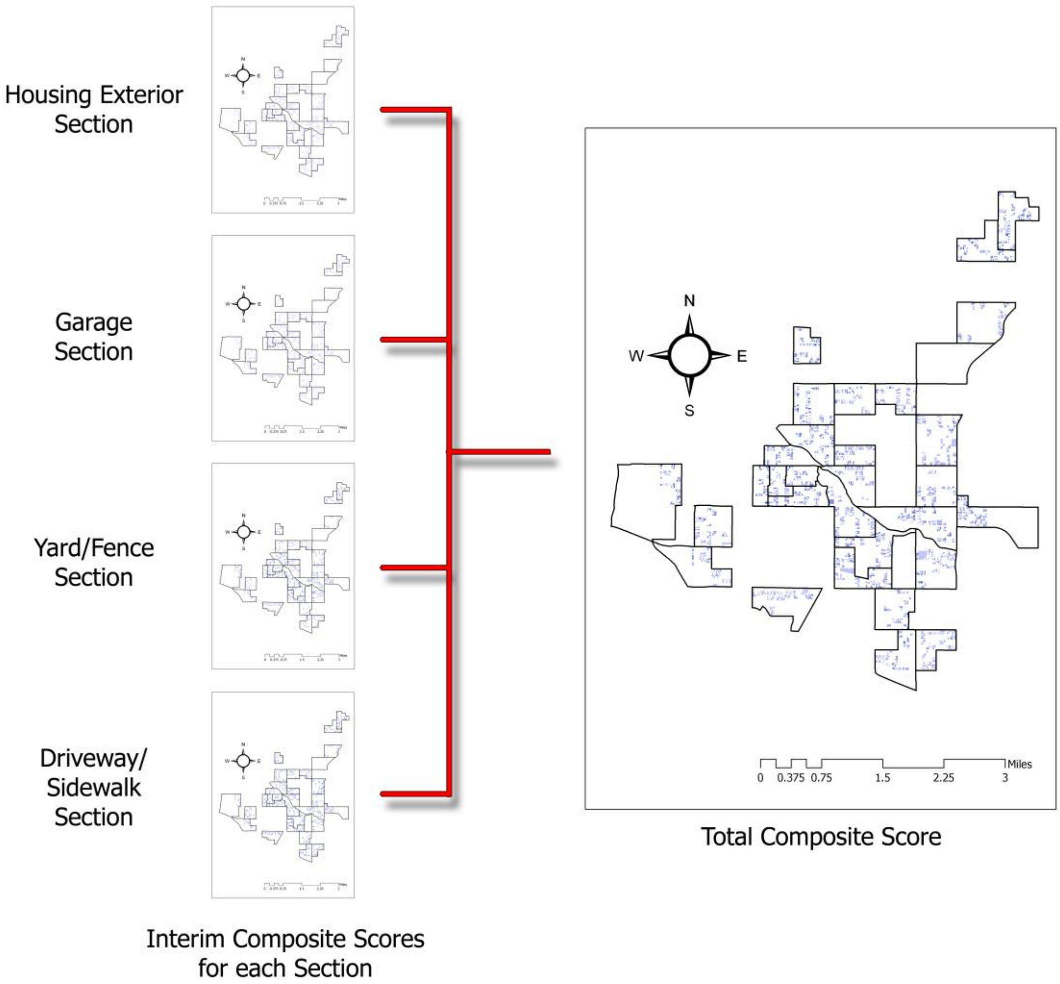


Figure 23. Total composite score obtained by aggregating interim composite scores from four categories (sections)

The previous three steps are involved in the process of obtaining total composite scores for each parcel. For statistical analysis purpose, however, it is needed to calculate the average composite scores: average interim composite score and average total composite score. Averages of all parcels' data within a block are used as a representative value for the block as a whole. Also, averages of all blocks' data within a block group are used as a representative value for each block group.

Usually, when people think about calculation of a representative value, three measures of central tendency are generally stated, including arithmetic average (mean), median, and mode. Arithmetic average (mean) is the most commonly used. In a block, the sum of all total composite scores from all parcels is divided by the number of parcels within the block, which is the way to obtain an average (mean) for the block. Median is the value that falls in the numerical center of a list of total composite scores from all parcels within a block. And the mode is the one that appears most often in a set of total composite scores within a block.

If there is at least one exceptional value (i.e., total composite score) in a block, we know that the average (mean), median, and mode of a set of values in the block could be different from each other. In other words, there might be a considerable spread around the average (mean) within the block. Because of variance, using average (mean) as a representative value for the condition of dwelling structure and environment of the block in a statistical analysis is not suitable because average value for the block will eliminate the spread. And, it will result in an incorrect statistical outcome. But, if there are no extreme values (i.e., exceptional total composite scores) within a block, average (mean) value will be the best representative value to measure the overall condition of dwelling structure and environment of the block (Freedman, D., Pisani, R, Purves, R. 1978).

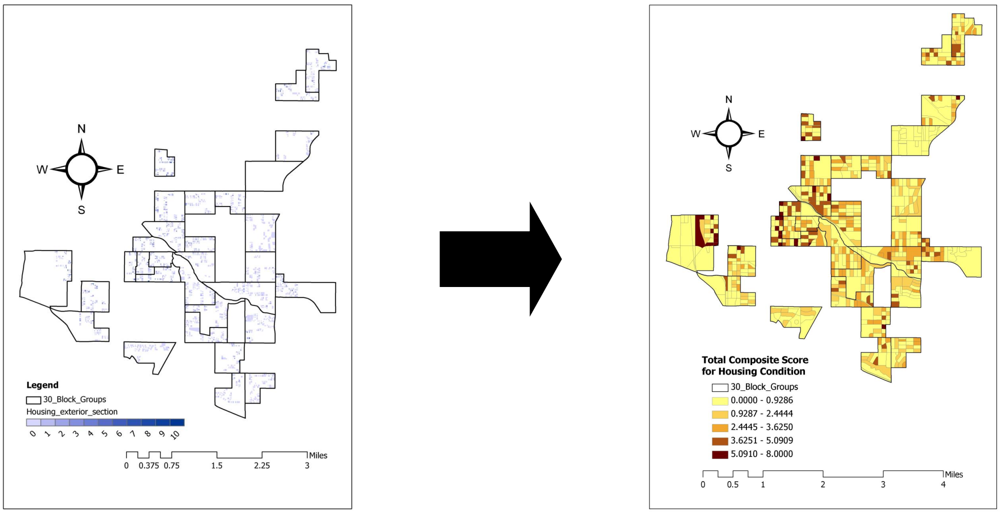


Figure 24. Calculating averages of parcel data within blocks
(Representative value for a block: Average (mean))

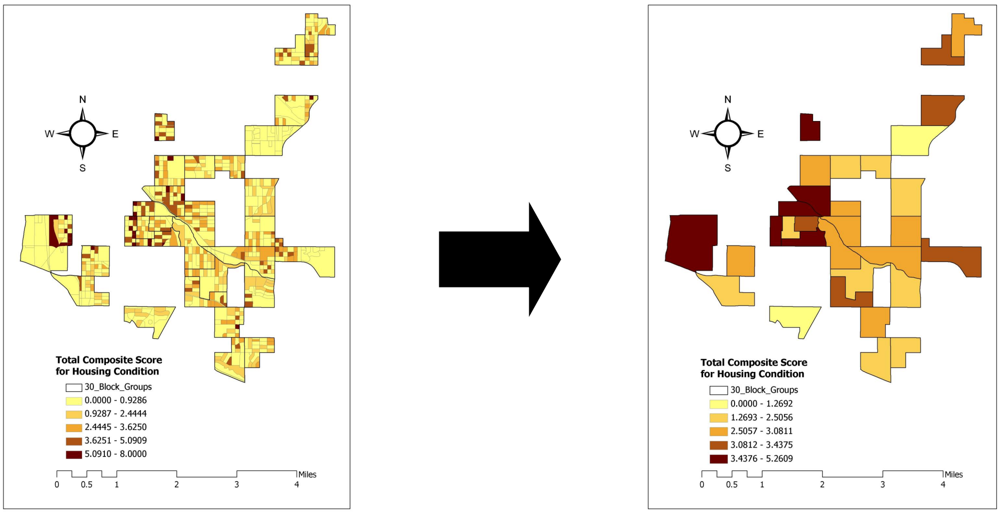


Figure 25. Calculating averages of block data within block groups
(Representative value for a block group: Average (mean))

To analyze the relationship between housing condition (i.e., the condition of dwelling structure and environment) and the level of social capital, interim and total composite scores are used together when we analyze the relationship statistically. This is because housing condition could be differently perceived from another angle. Total composite scores are composed of four interim composite scores: house, garage, yard & fence, and driveway & sidewalk. Those interim composite scores are also classified into two groups: structural parts (i.e., house and garage) and non-structural parts (i.e., yard & fence and driveway & sidewalk).

Even if the main issue of this dissertation research is to examine the association between housing condition and the level of social capital, the total composite score does not tell everything about housing condition (i.e., the condition of dwelling structure and environment) because an interim composite score might be more helpful and adequate to understand the relationship between them. In this sense, we will examine each interim composite score by categories.

1) House

Among structural parts, the house category is one of them. The other category is garage. When we know the conditions of both categories for one parcel, it would be possible to determine the overall condition of the structural part for the parcel. There are eight questions in the house category (housing exterior section). Figure 26 shows the distributions of parcels based on the answers to each of the eight questions in the house category.

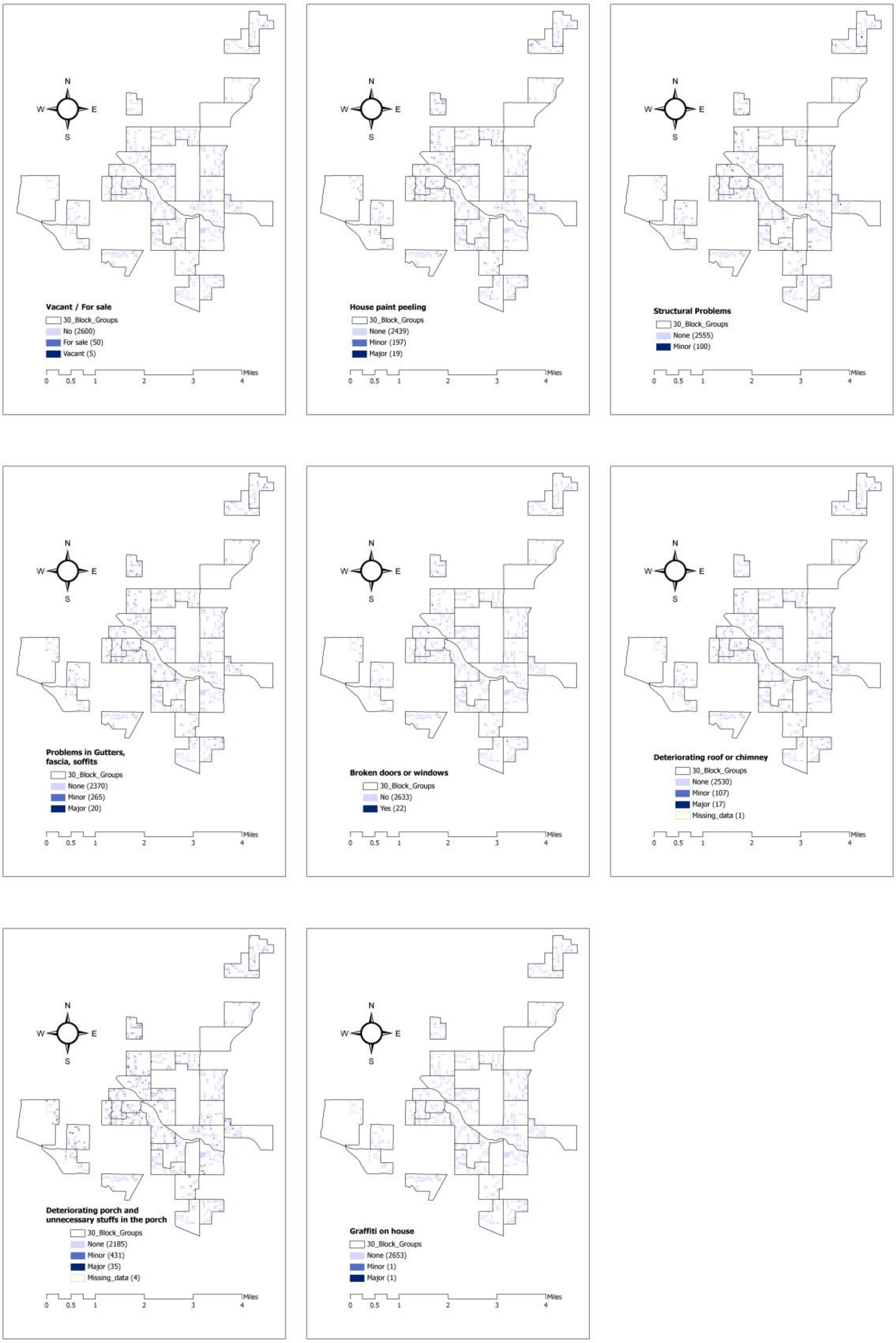


Figure 26. Distributions of parcels regarding eight questions in the house category

To make interim composite scores for the house category, these maps are reclassified and combined using ArcGIS, which is the data aggregation step. Then the aggregated data for parcels within a block are calculated to measure the representative value for a block in statistical analysis.

The following figures (Figure 27 and Figure 28) are the summary maps showing block-level and block group-level interim composite scores for the house category. The values represented are used in the statistical analysis. However, block group-level interim composite scores are used to measure how social capital is affecting housing management, as measured by the condition of dwelling structure and environment. When we compare the impacts of the two main independent variables (social economic status which is neighborhood characteristics vs. social capital) on housing management, the analysis unit for statistical analysis should be the same. Thus block group is the adequate unit for the statistical analysis.

However, among social capital indicators, there might be more strongly correlated indicators with housing management (i.e., the condition of dwelling structure and environment). Social capital variables are obtained at the block level, so that block-level interim composite scores will help to study which indicators are more correlated with housing condition measures.

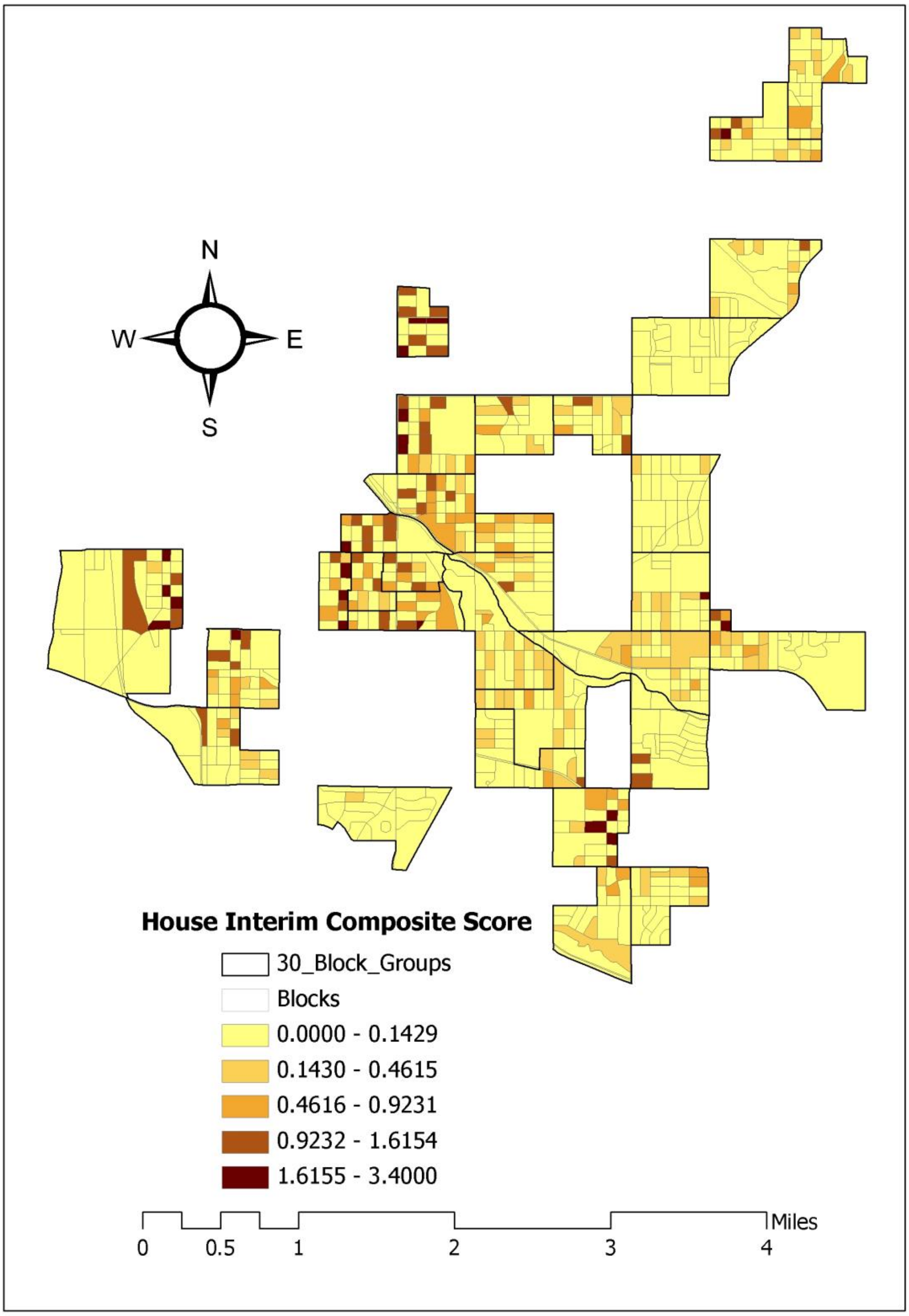


Figure 27. Block-level interim composite scores for the house category

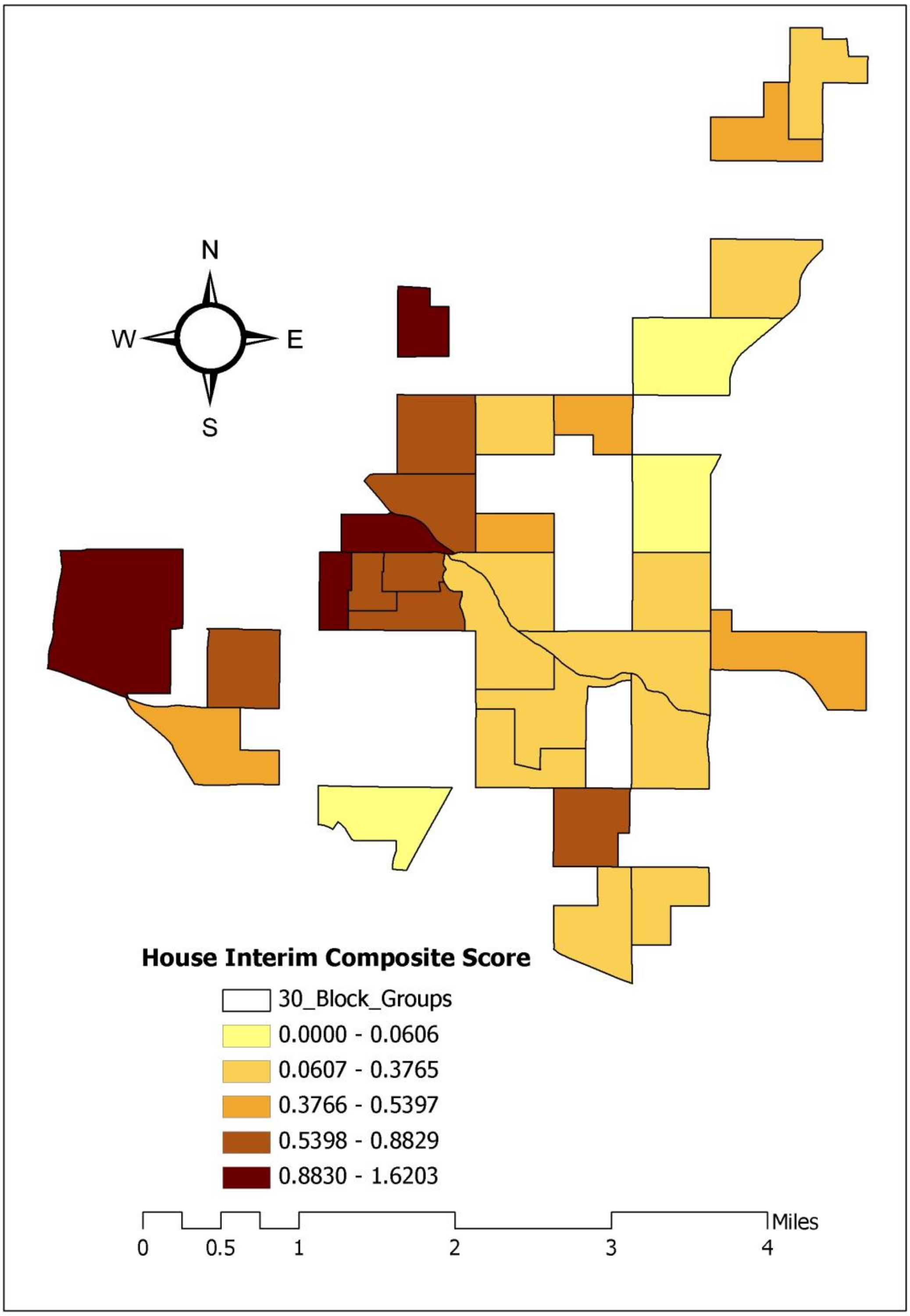


Figure 28. Block group-level interim composite scores for the house category

2) Garage

Among structural parts, the other category is for a garage. In order to ascertain the condition of a garage, three questions are dealt with in the survey (i.e., housing condition survey): structural problem, paint peeling problem, and broken or boarded windows (doors). Figure 29 shows the distribution of parcels by each issue regarding a garage.

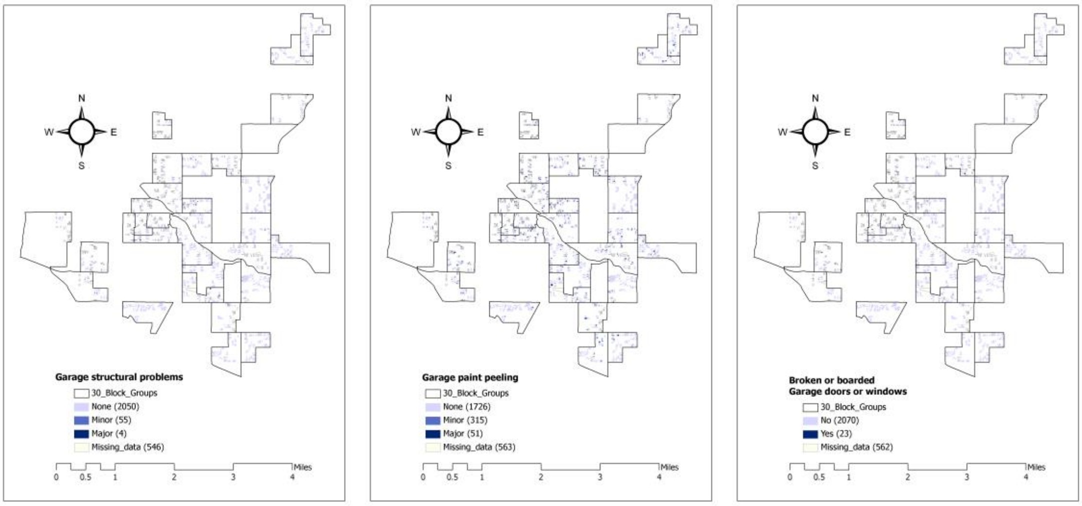


Figure 29. Distributions of parcels regarding three questions in the garage category

The maps are reclassified and combined for the data aggregation step. The aggregated data values by parcels within a block (a block group) are calculated in order to obtain the representative value for the block or the block group as a whole. The following figures (Figure 30 and Figure 31) are the maps showing block-level and block group-level interim composite scores for the garage category.

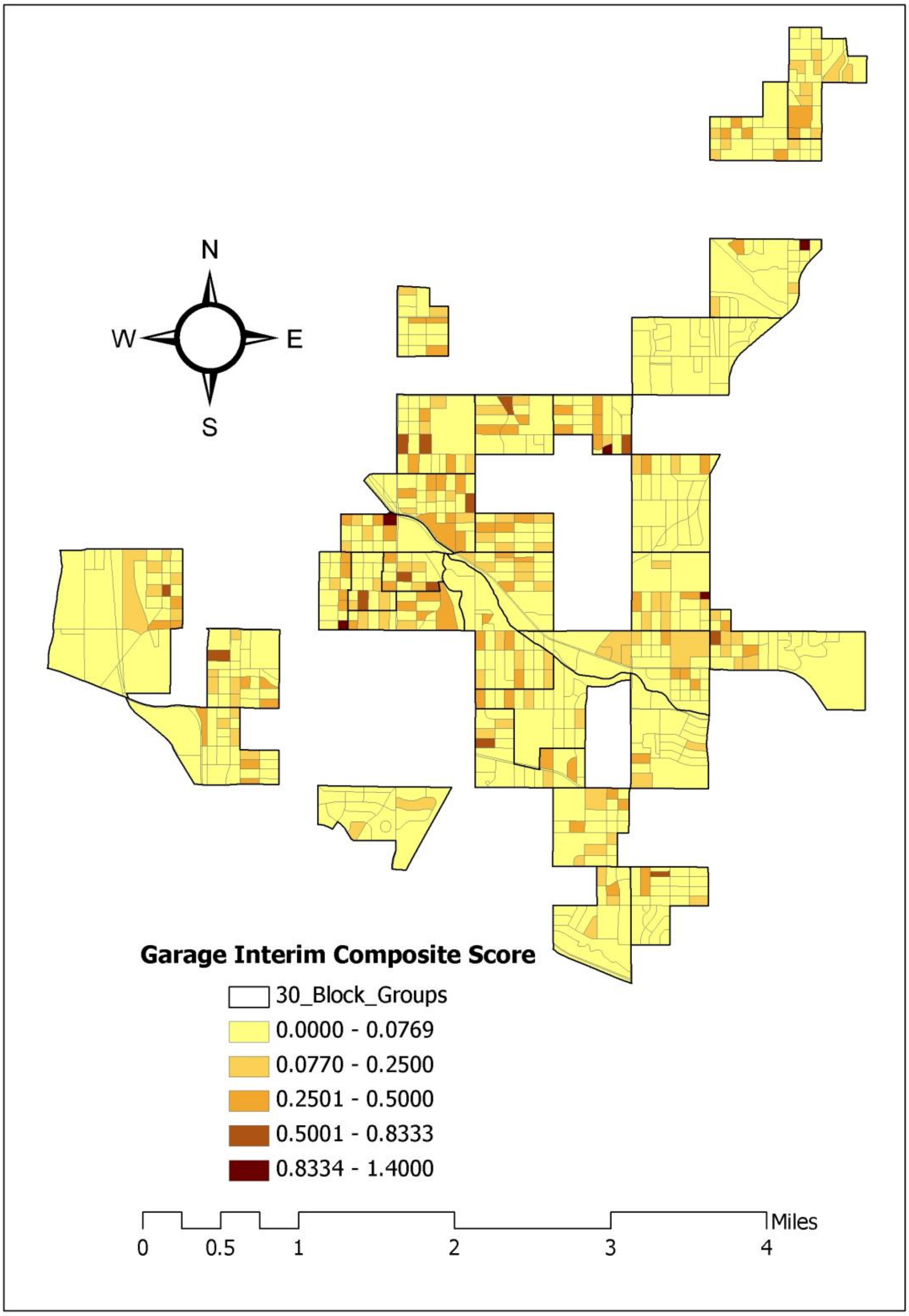


Figure 30. Block-level interim composite scores for the garage category

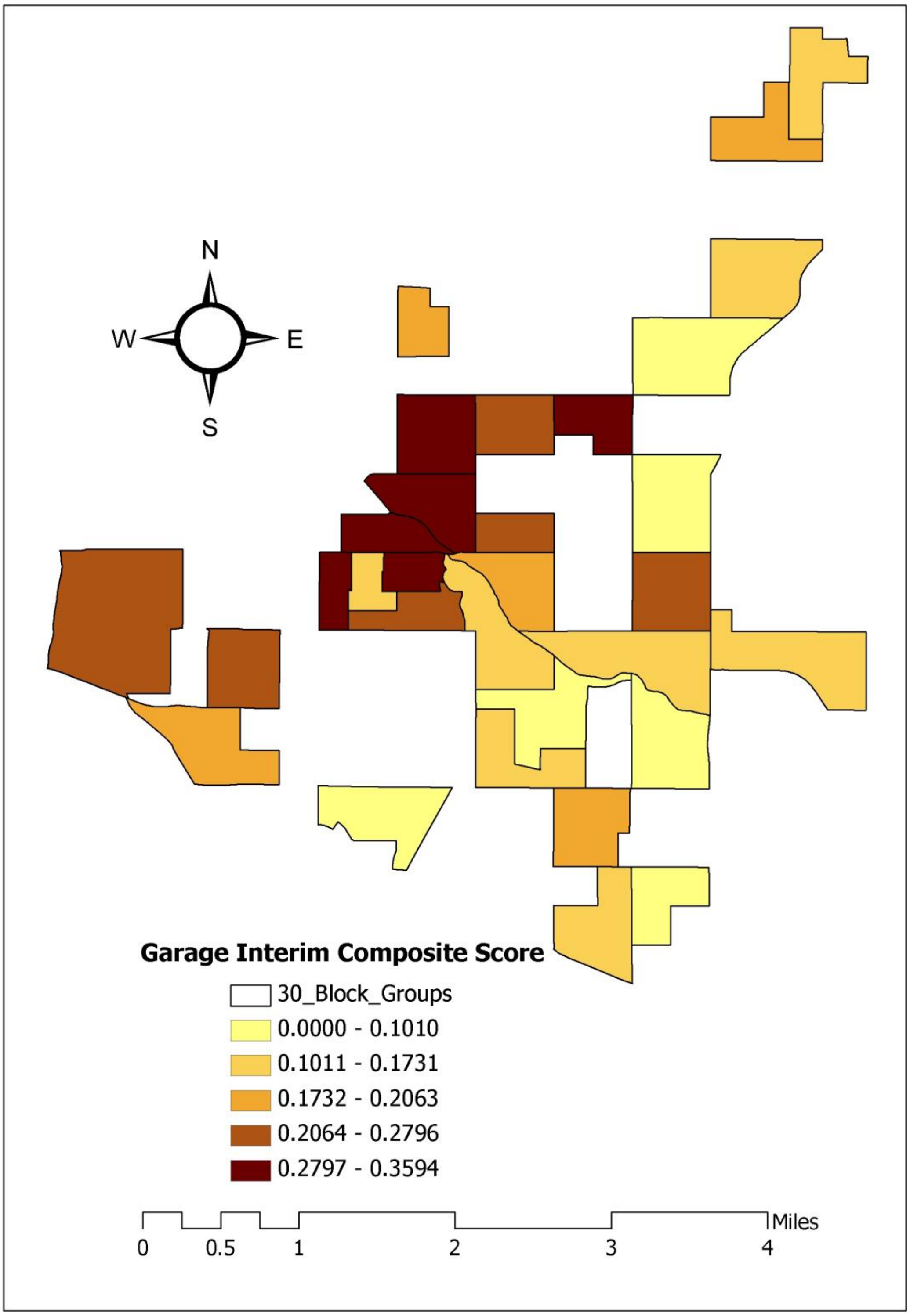


Figure 31. Block group-level interim composite scores for the garage category

3) Yard and Fence

Yard and fence are non-structural parts of a house. The condition of them shows how well dwelling environment is managed by the owner of the house. The non-structural part of a house is composed of two categories: yard & fence and driveway & sidewalk. The condition of dwelling environment is nearly as important as the condition of dwelling structure because the visual impression (impact) of the non-structural parts (e.g., yard, fence, driveway, and sidewalk) of a house can influence people’s attitudes and behaviors. In order to assess the condition of yard and fence, a total of five questions are dealt with in the survey. With regard to yard, litter, grass over ten inches tall, brush and overgrown weeds, and not managed (or not arranged) housing appliances are the issues inspected in the survey. In terms of fence, broken or leaning fences are the main issue. Figure 32 shows the distribution of parcels by issue regarding yard and fence.

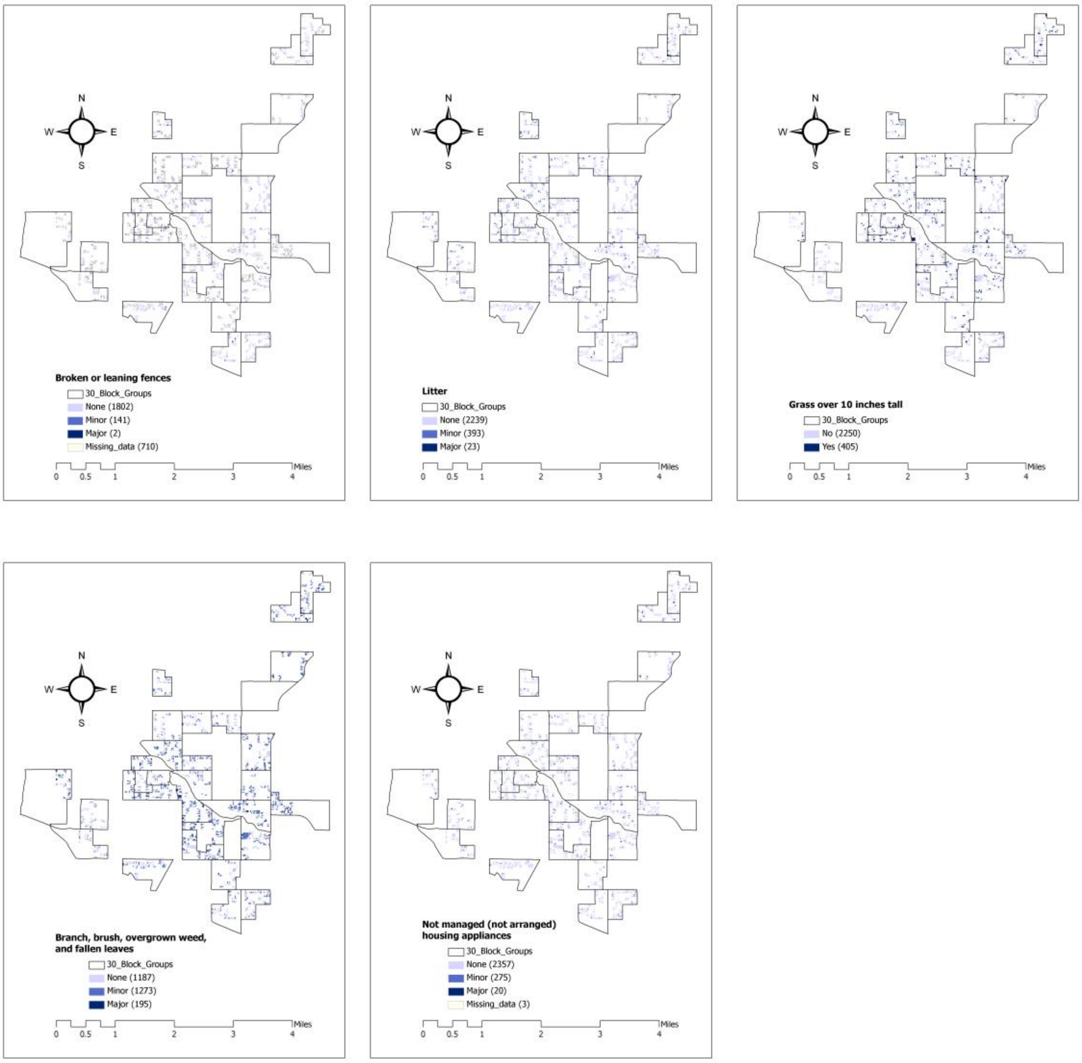


Figure 32. Distributions of parcels regarding five questions in the yard & fence category

In the same manner as with the previous two categories, the maps are reclassified and combined for data aggregation. The aggregated data by parcels within a block or a block group is used to calculate the representative value for the block or the block group for later statistical analysis. The following figures (Figure 33 and Figure 34) are the maps which show block-level and block group-level interim composite scores for the yard and fence category.

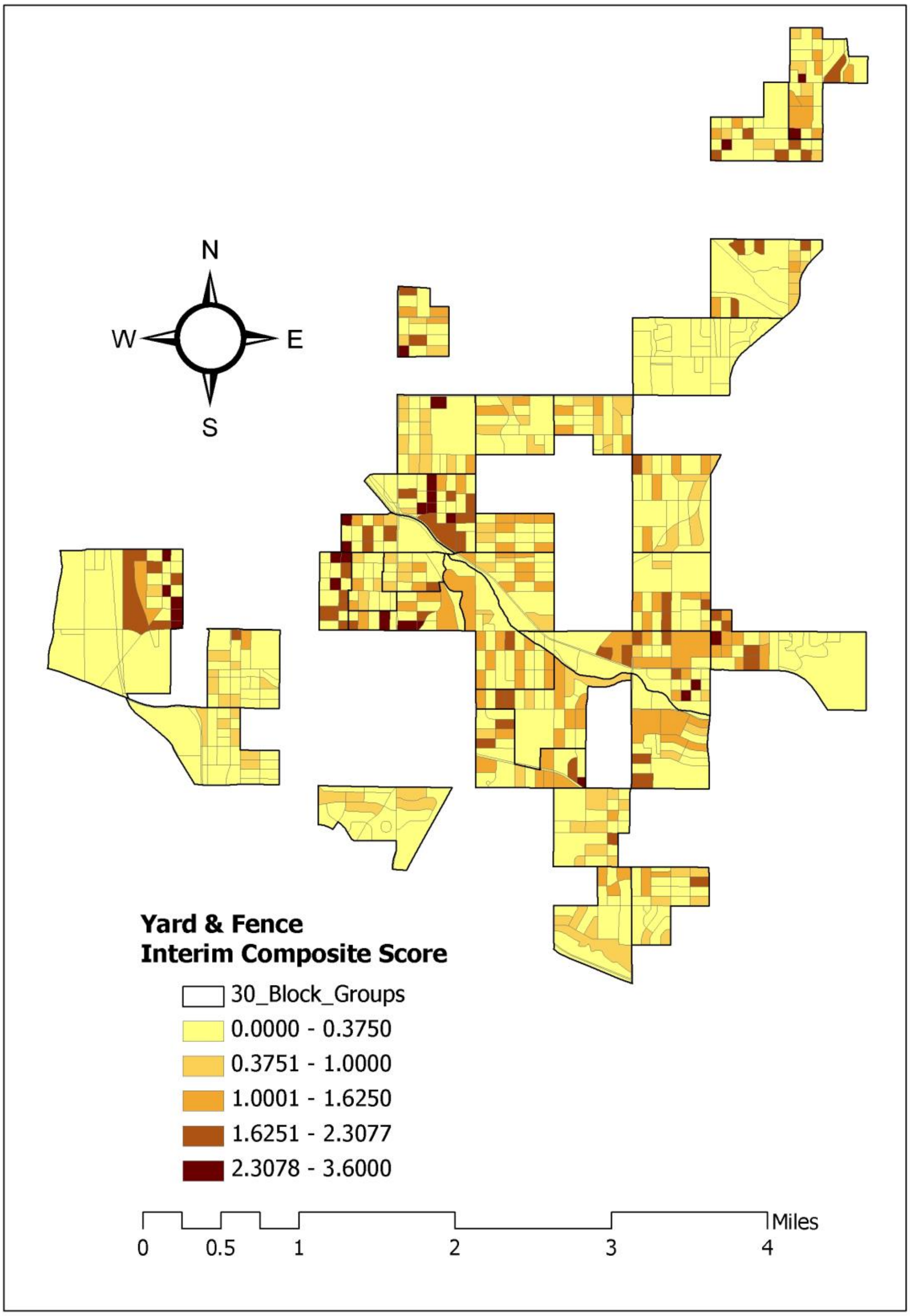


Figure 33. Block-level interim composite scores for the yard and fence category

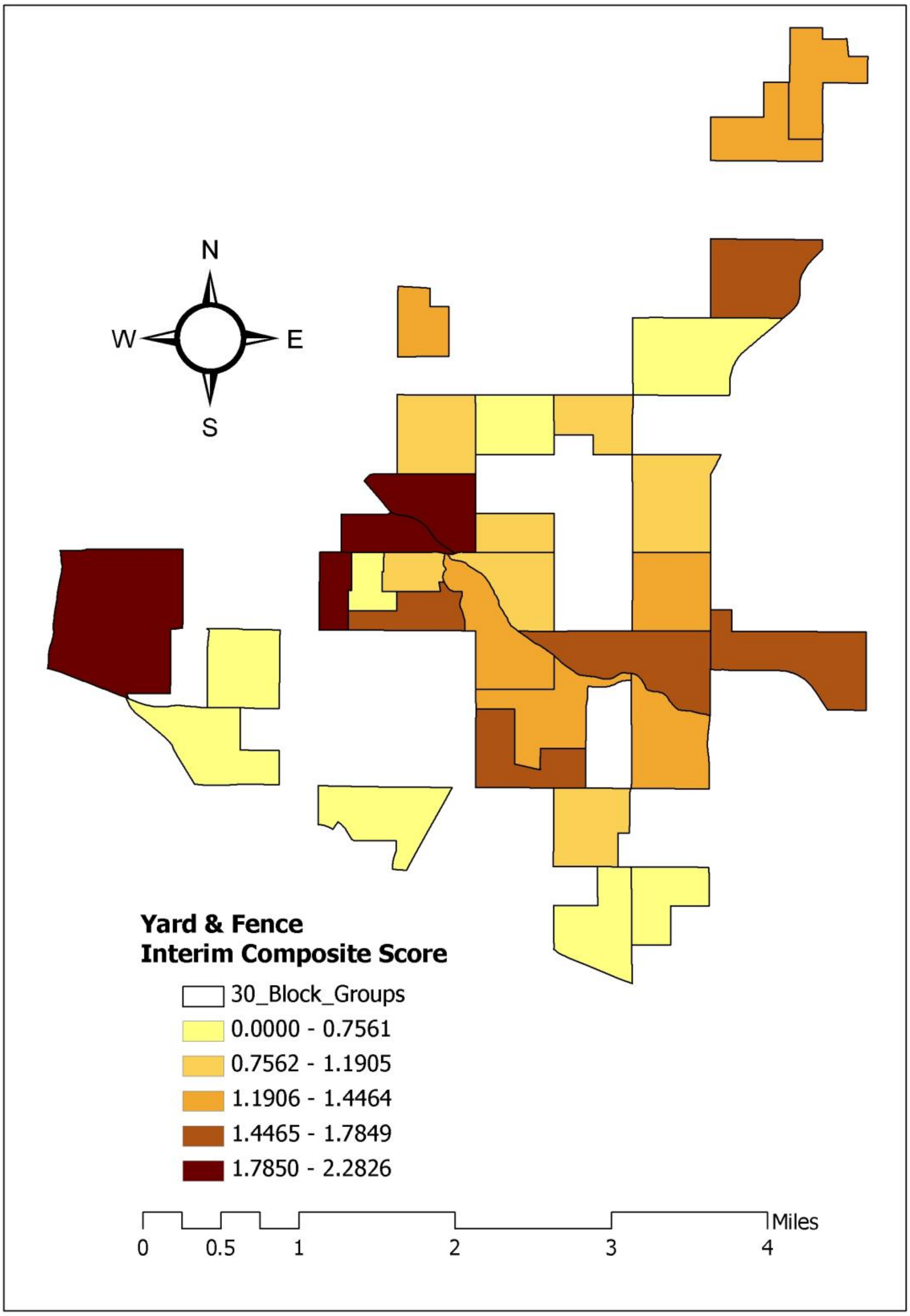


Figure 34. Block group-level interim composite scores for the yard and fence category

4) Driveway and Sidewalk

Driveway and sidewalk are also non-structural parts of a house, which is considered as dwelling environment. A driveway is a private road which allows people to access a house or a structure. It is owned and maintained by an individual or a group. In contrast, a sidewalk is a path along the side of a road, which is owned and maintained (in the City of Lincoln) by a public organization: a city or a county.

The driveway and sidewalk may be used as social places like a yard and house. People can meet and talk to each other on the street and driveways. Thus, it is expected that the condition of dwelling environment including driveway and sidewalk is associated with the level of social capital.

In order to assess the condition of driveway and sidewalk, a total of three questions are dealt with in the survey. The three issues inspected in the survey are as follows: cracked, bumps, or weeds on the driveway, cracked, bumps, or weeds on the sidewalk, and other obstructions on the sidewalk (overgrown branch, shrubs, etc). Figure 35 shows the distribution of parcels by two categories: driveway and sidewalk.

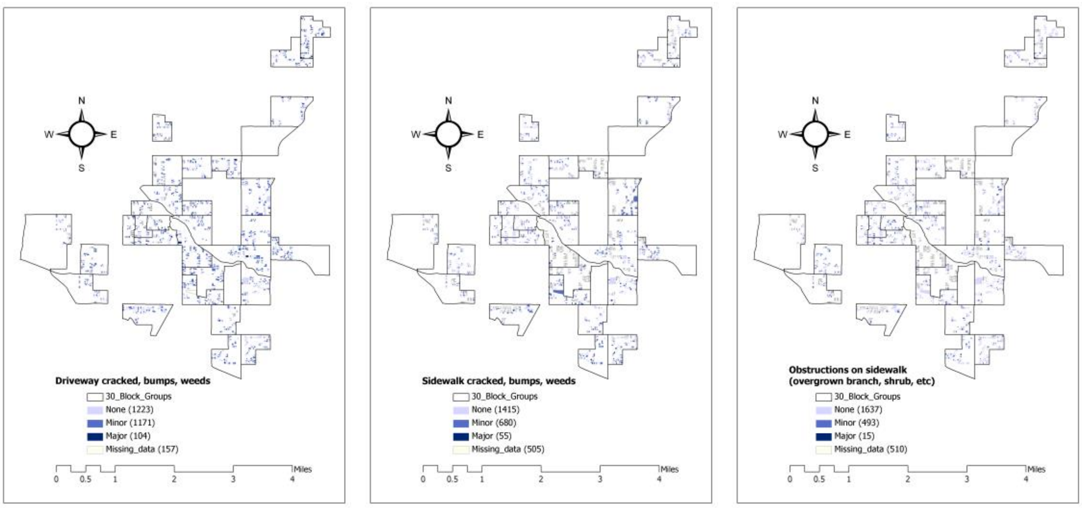


Figure 35. Distributions of parcels regarding three questions
in the driveway and sidewalk category

The three maps above are reclassified ones. They are combined for the data aggregation step. The aggregated data values of driveway and sidewalk by parcels within a block or a block group are used to calculate the representative value (i.e., average value) for the block or the block group for later statistical analysis. The following figures (Figure 36 and Figure 37) show block-level and block group-level interim composite scores for the driveway and sidewalk category.

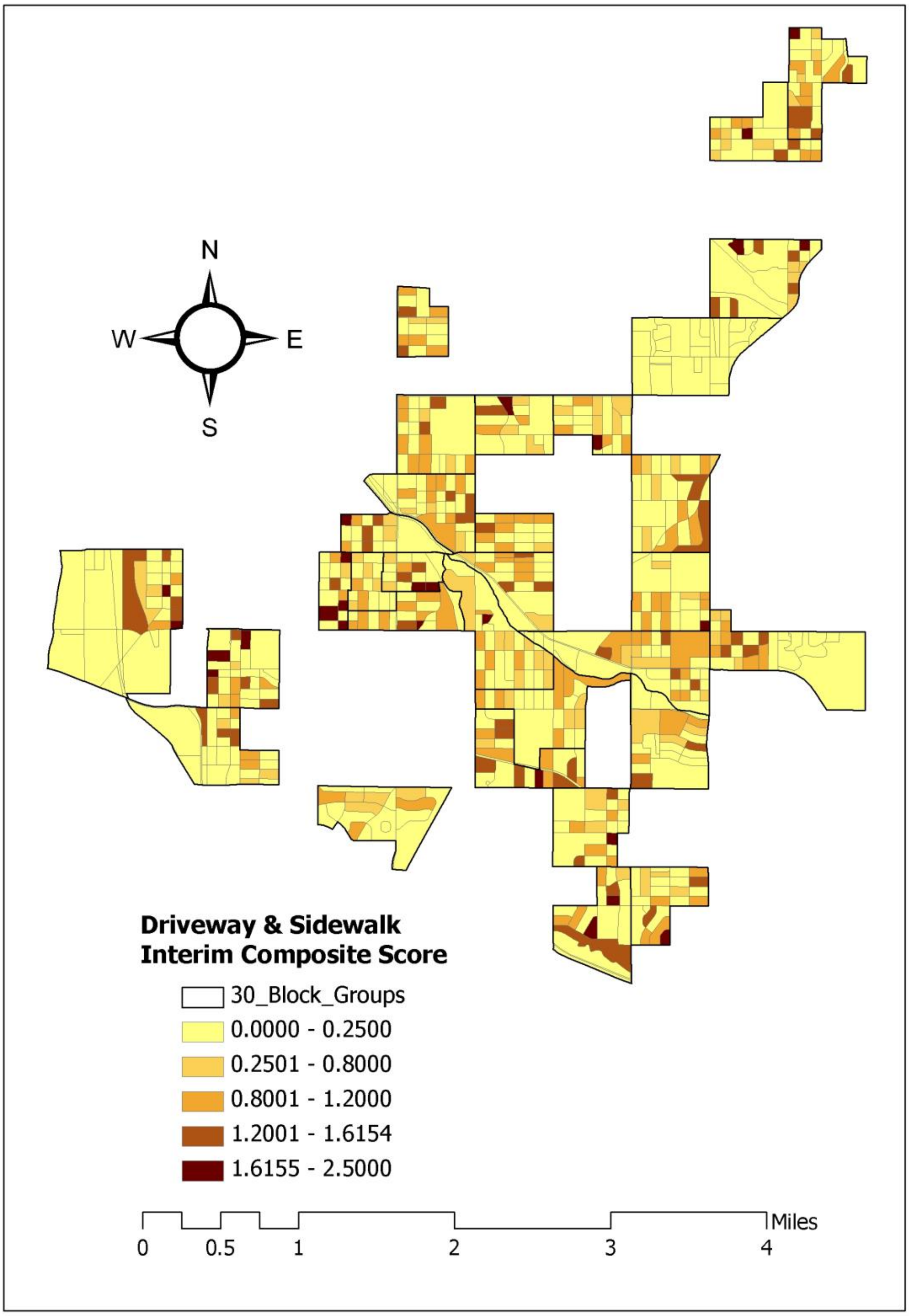


Figure 36. Block-level interim composite scores for the driveway and sidewalk category

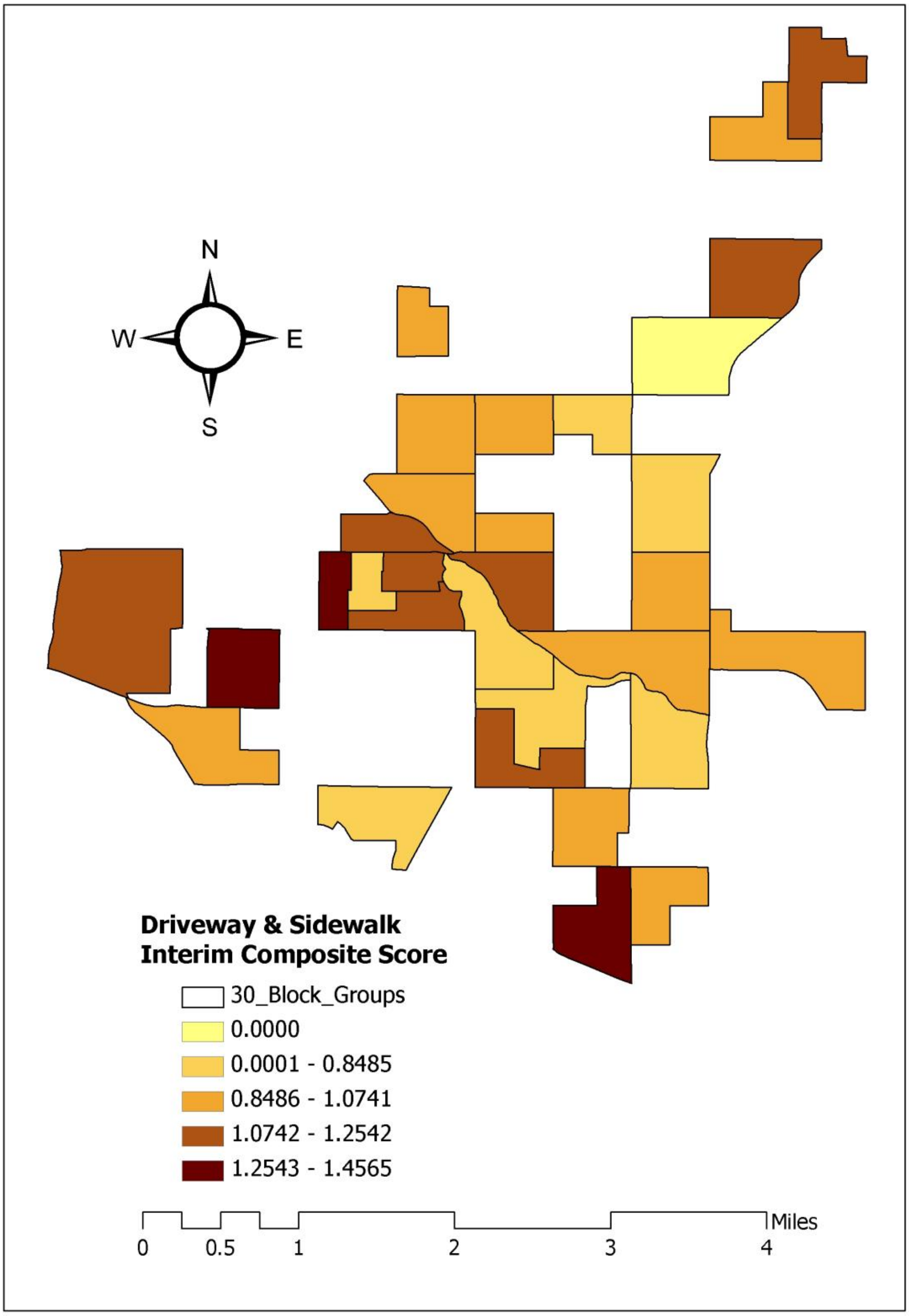


Figure 37. Block group-level interim composite scores for the driveway and sidewalk category

5) Dwelling Structure (Structural part)

Dwelling structures involve two categories: housing exterior (house) and garage. They have visible structures, which differentiates from the dwelling environment. In the category of housing exterior, there are eight questions dealt with in the survey to assess the condition of housing exterior. And there are three questions inspected to assess the condition of garage category. Instead of combining eleven reclassified maps, we combined two interim composite scores from two categories: housing exterior (house) and garage. Thus, the condition of dwelling structure is measured by combining the two interim composite scores. Figure 38 and Figure 39 show block-level and block group-level interim composite scores for the dwelling structure.

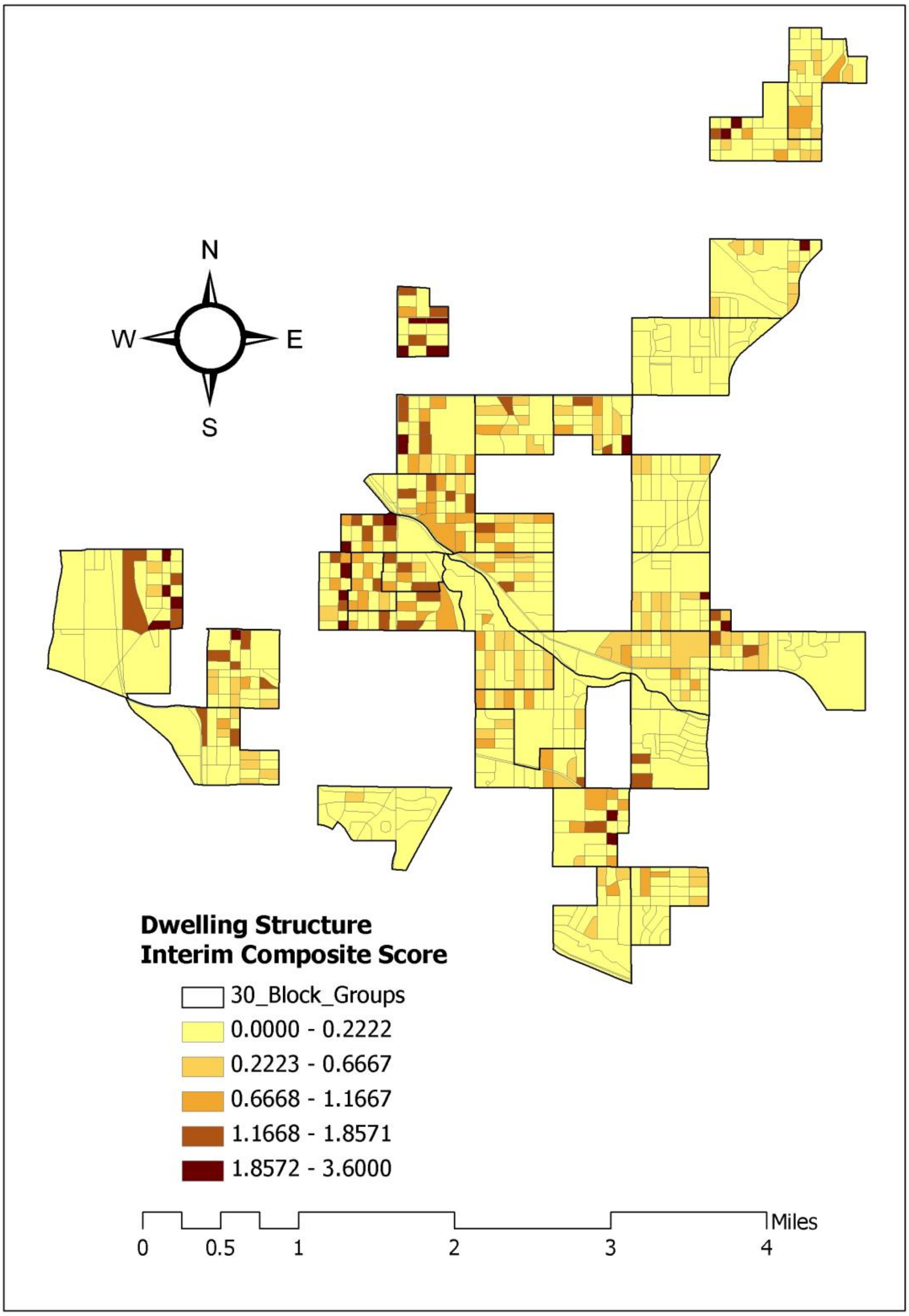


Figure 38. Block-level interim composite scores for the dwelling structure

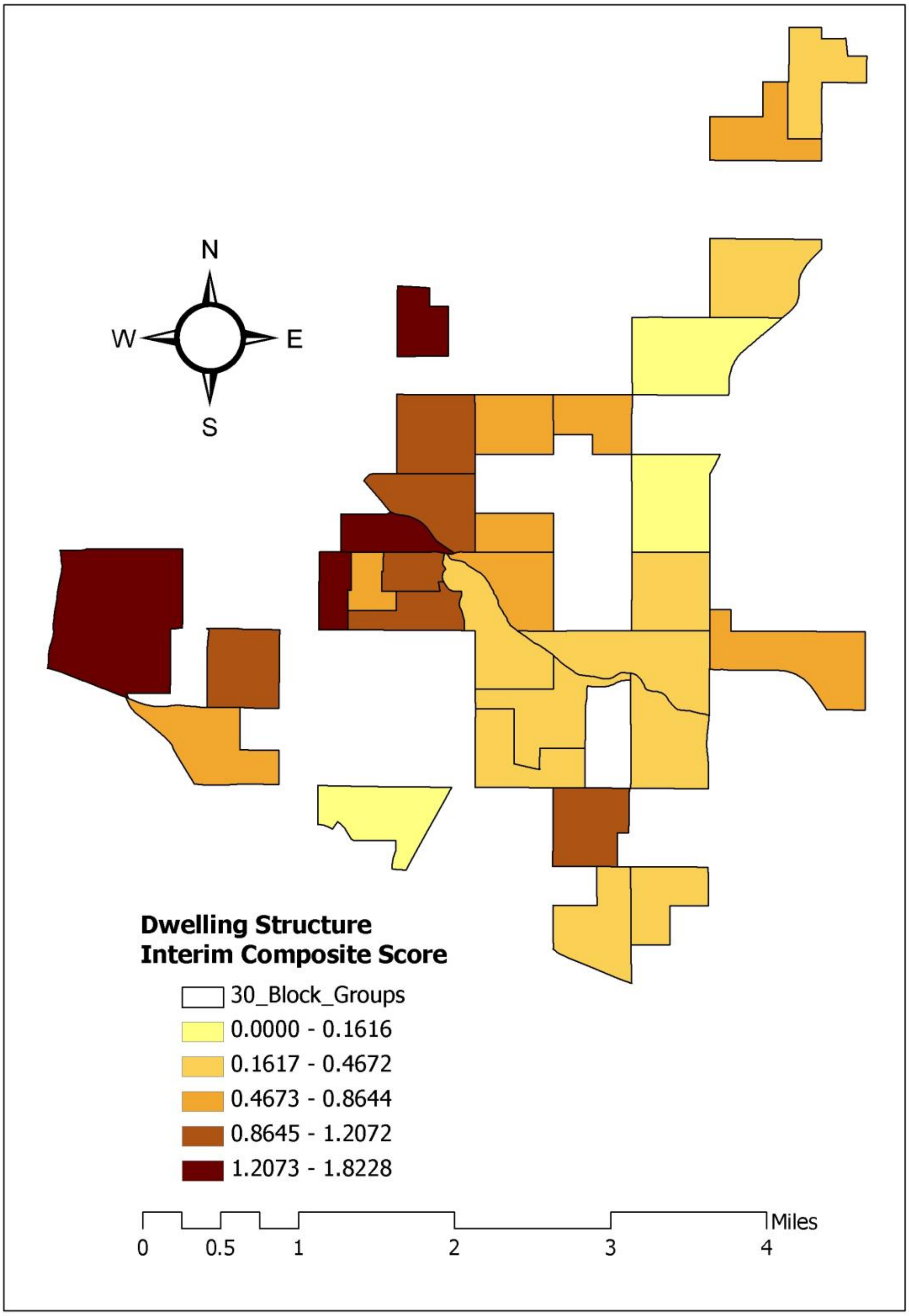


Figure 39. Block group-level interim composite scores for the dwelling structure

6) Dwelling Environment (Non-Structural parts)

When compared to dwelling structure, dwelling environment is a somewhat broad concept. It is not clear to define the concept as we mentioned previously. However, in order to examine the impact of social capital on the dependent variable of condition of dwelling structure and environment in more detail, the dependent variable may need to be classified specifically based on each category's feature. The classified dependent variables may give more detailed information about the relationship with social capital. Thus, we classify dwelling environment into two categories: yard & fence and driveway & sidewalk. The two categories are not related to a structure or a building. Primarily they are environmental issues. Thus, the questions dealt with in the survey for the two categories include litter, grass over ten inches tall, overgrown weeds, not managed housing appliances, cracked driveway and sidewalk, obstructions on sidewalk, and so on.

A total of eight questions were dealt with in the survey. As was done to get the interim composite score for dwelling structure, the two composite scores from the two categories (yard & fence and driveway & sidewalk) are combined to get the composite score for the condition of dwelling environment. Figure 40 and Figure 41 show block-level and block group-level interim composite scores for the dwelling environment.

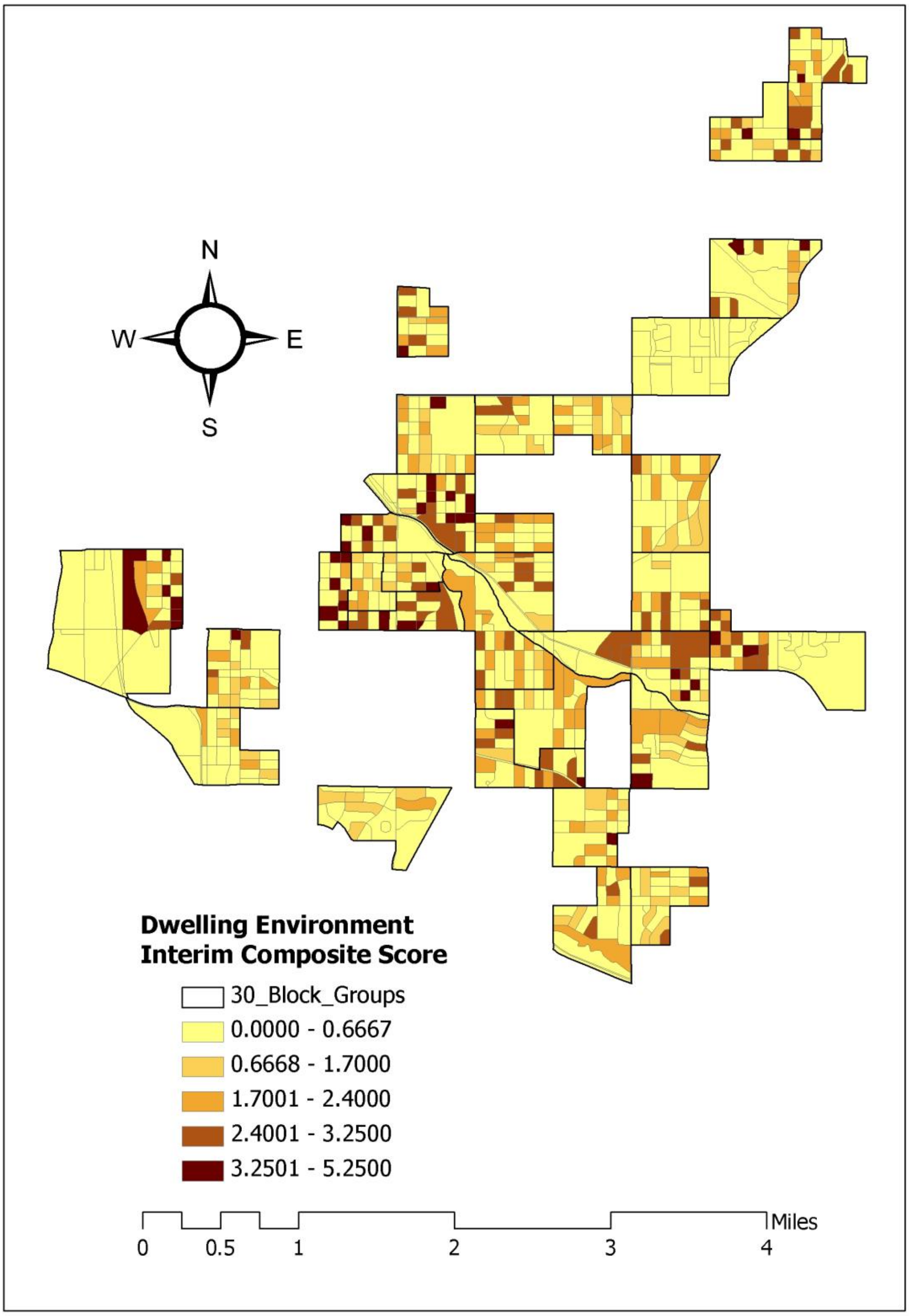


Figure 40. Block-level interim composite scores for the dwelling environment

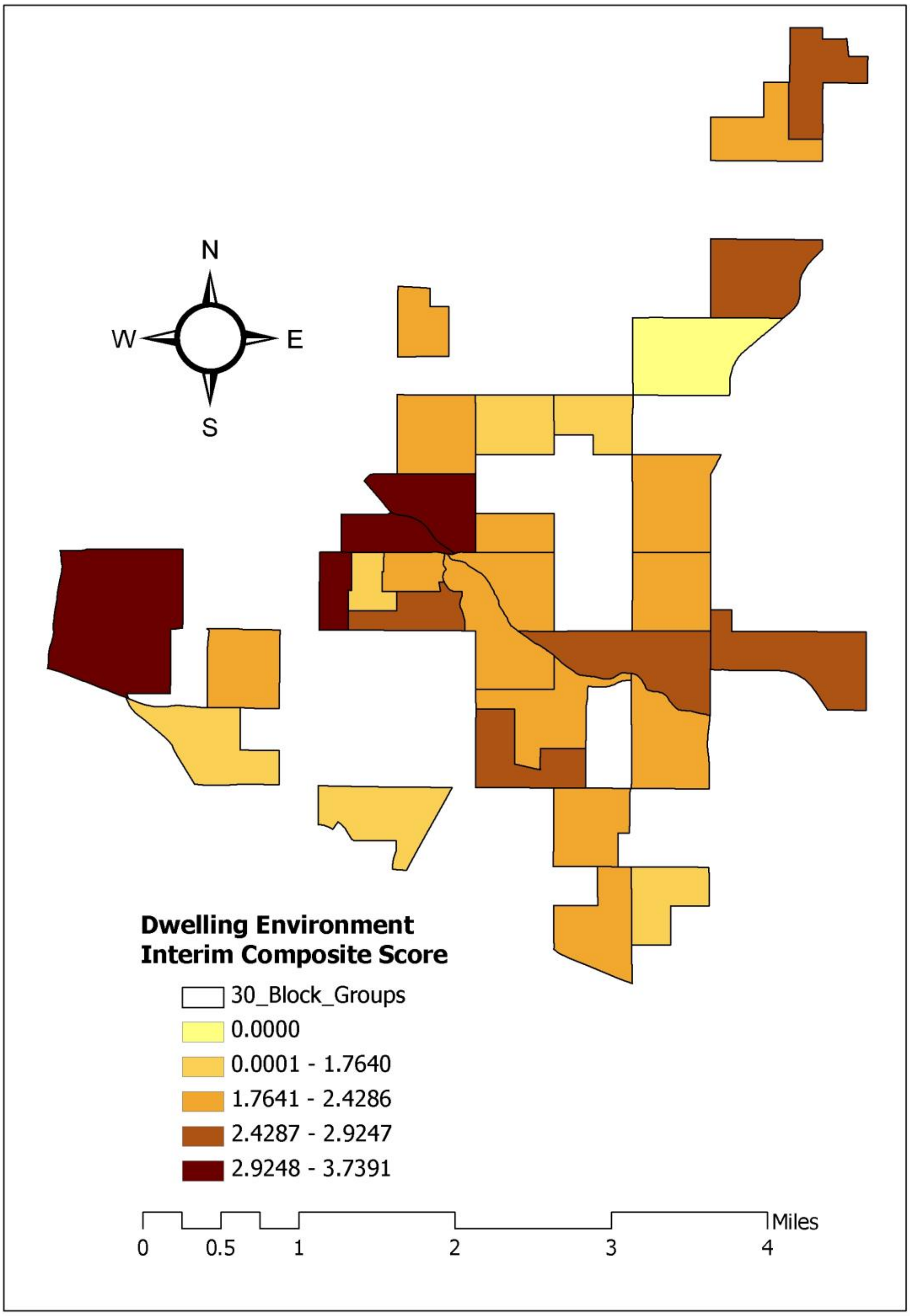


Figure 41. Block group-level interim composite scores for the dwelling environment

7) Total Housing Condition

Total housing condition represents overall condition of dwelling structure and environment. It is composed of four categories: housing exterior (house), garage, yard & fence, and driveway & sidewalk. Total housing condition is measured by a total composite score which is obtained by combining interim composite scores of the four categories.

Figure 42 and Figure 43 show block-level and block group-level total composite scores for overall condition of dwelling structure and environment.

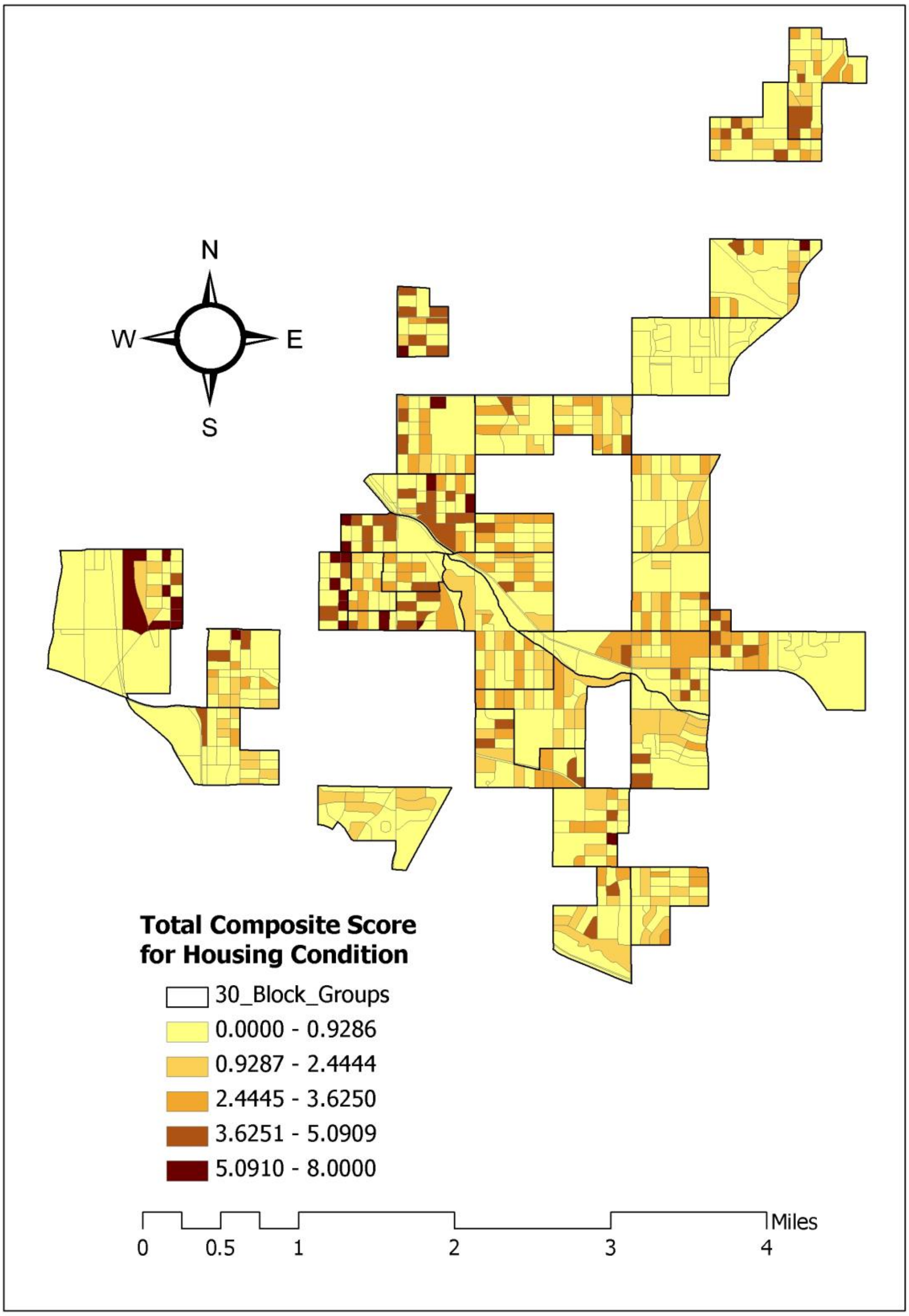


Figure 42. Block-level total composite scores for housing condition

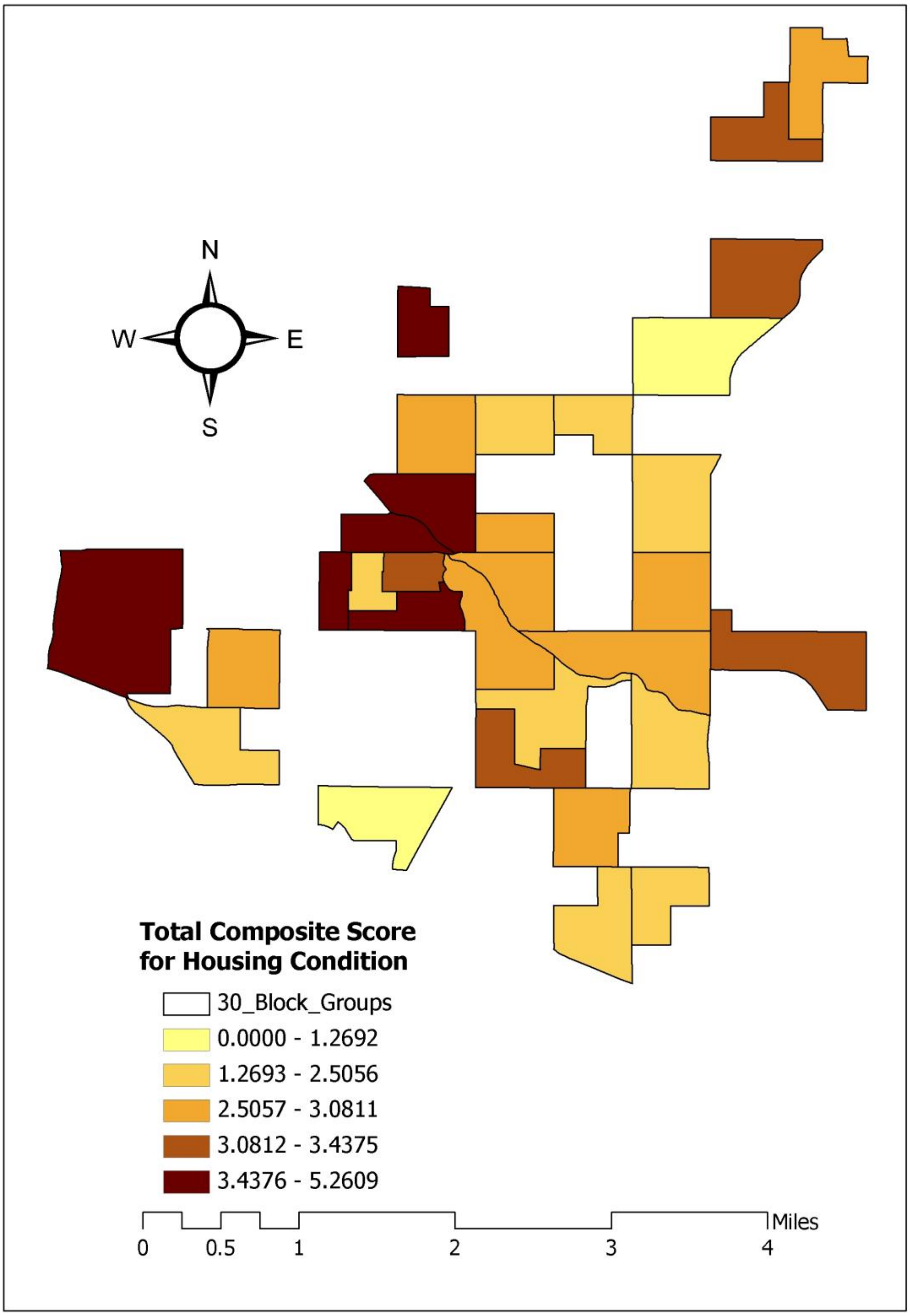


Figure 43. Block group-level total composite scores for housing condition

Collecting Social Capital Data

Social issues and problems are very complex and uncertain, so it is hard to investigate them in a research project. Furthermore, there are few sources of direct evidence (data) representing social problems or issues which are needed to do the research. That is why we are compelled to use indirect data related to social issues. However, this does not mean that indirect data can resolve the complexity or difficulty of measuring the social problems or issues because indirect data can also have some limitations. Based on these factors it can be seen that, measuring the level of the social problems or issues using indirect data is not simple.

Social capital is one of the most complex social issues in the field of social science. It is also difficult to measure the level of social capital of a community. Many researchers have been studying and collecting social capital data through household surveys to evaluating trust (Glaeser et al. 2000), membership (Wollebaek and Selle 2003), and network resources (Zhao 2002) among residents.

In this dissertation research, however, indirect data (i.e., indicator) representing social capital are used instead of household survey data to measure levels of social capital for all block groups in Lancaster County (NE). The main sources of the indirect data are U.S. Census data and public GIS data from the city of Lincoln. Furthermore, the geographical units for analysis in this dissertation research are block and block group. Conducting a household survey anonymously is difficult because randomly selected houses (i.e., parcels in a block) are a few in a small block. Thus, it may not be possible to insure privacy due to the small size of analysis units. In an extreme case, the number of houses being evaluated could be as few as one or two in a block. Grootaert (2001) discussed about four categories representing social capital. The four categories have all been used in previous empirical studies for social capital. Among the four categories, three of them are dealt with in this dissertation research: 1) horizontal associations (horizontal sense of belonging to a community); 2) civic and political engagement; and 3) society integration.

Categories	Indicators
Horizontal sense of belonging to a community	1. Housing price inequality 2. Homeownership rate
Civic and political engagement	3. Voter turnout
Society Integration	4. Ethnic Diversity 5. Family status (Marriage and Children) 6. Social mobility (Community attachment) 7. Crime (Incidence and Loss & Damage)

Table 22. Indicators of Social Capital (Christiaan Grootaert, 2001, Page 15)

Horizontal Associations (Horizontal sense of belonging to a community)

Sense of community as defined by McMillian and Chavis (1986) is comprised of four major components: (1) membership, (2) influence, (3) integration and fulfillment of needs, and (4) shared emotional connections. An individual's sense of belonging to a particular group or community is defined by those components. According to Pooley, J. , Cohen, L. , & Pike, L. (2005), the components have various attributes: boundaries (in-group vs. out-group), emotional safety (protection of group intimacy), sense of belonging and identification (feeling that one belongs to the community and is willing to make sacrifices for the community), personal investment (working for the community leads to feelings that they have earned membership which is valuable and meaningful), and a common symbol system (means of identifying who belongs to a community).

With regard to an individual's sense of belonging to a community, there are many

indicators to measure the level of sense of belonging to a community. However, only some of them could be available because there are limitations to data collection.
Until recently, only a few indicators including income homogeneity, housing price inequality, and homeownership rate are available to represent the level of the sense of belonging to a community.

Housing Price Inequality

Generally, people with low income desire to work for more hours to earn additional income. This leads them to participate in civic engagement less frequently compared to people with higher incomes.

Thus, the degree of income inequality is considered as an important aspect of the fairness of a society (The 2010 social report from the Ministry of Social Development in New Zealand). According to the report, “a high level of income inequality may be detrimental to the level of social connectedness across society.” In other words, if the degree of income inequality within a community is large, a low income group may feel comparative deprivation. As a result, they may not want to associate with their colleagues from work and not want to be socially connected with their neighbors in a community. In this way, income inequality may damage the relationship between residents (Anil Rupasingha, Stephan J. Goetz, David Freshwater. 2006). Accordingly, greater income inequality reduces social capital levels.

Alesina and La Ferrara (2000) mentioned that “participation in associational activities is significantly lower in localities with greater income inequality.” Based on their investigation, the ratio of the mean household income to the median household income in a county is used to measure income inequality in their research.

There are many methods to measure the degree of income inequality of a community.

Gini coefficient, 20:20 ratio, Palma ratio, and Hoover index are the methods commonly used. Of them, the Gini coefficient is used in this dissertation research.

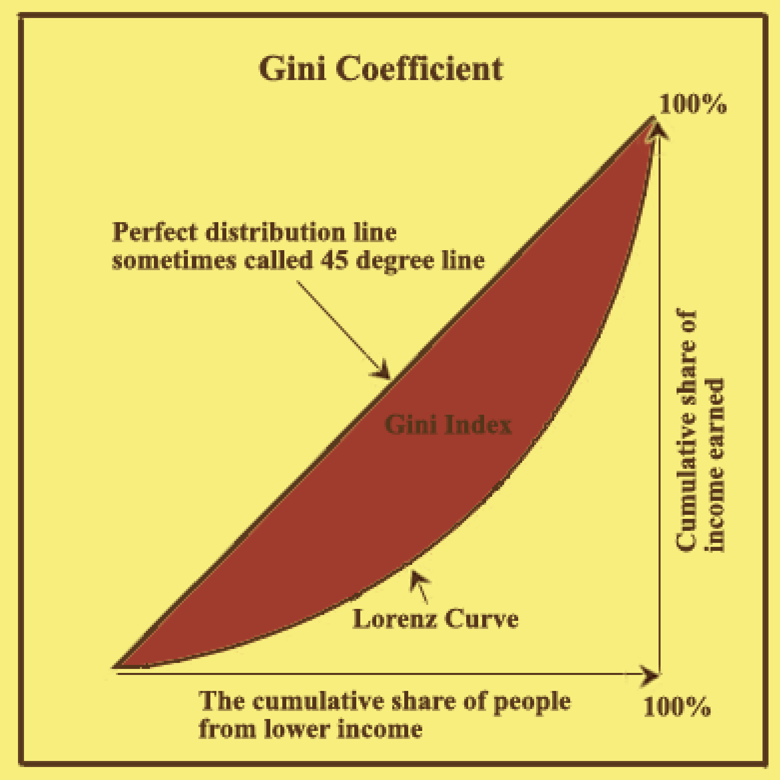


Figure 44. Graphical representation of the Gini coefficient

(Source: Inequality in Latin America, http://www.laits.utexas.edu/lawdem/unit03/reading2/Gini_definition.html)
Liberal Arts Instructional Technology Services at the University of Texas at Austin

$$g = \frac{1}{2n^2 f} \sum_{i=1}^{n} \sum_{j=1}^{n} |y_i - y_j|$$

Figure 45. The equation of the Gini coefficient

g: Gini coefficient

n: The number of sample

f: Average of n samples

(Sources: Damgaard, C., & Weiner, J. (2000), Page 1139)

Gini coefficient is frequently used to measure the inequality of an income distribution. According to Figure 44, mathematically, the Gini coefficient is the ratio of the area between the wealth distribution curve (which is a Lorenz curve) and a perfect distribution line to the area under the perfect distribution line (i.e., equal distribution curve). The Gini coefficient is defined as a ratio with values between 0 and 1. When the Gini coefficient is expressed as a Gini index, the Gini coefficient is multiplied by 100 to show the value as a percentage.

If the Gini coefficient is 0, it means perfect income equality. In contrast, the coefficient of 1 represents the community as in perfect income inequality: one person owns everything (i.e., income), while everyone, except for the one person, has nothing for income.

As is well known, there is no household income data at block level from the U.S. Census. Therefore in order to calculate Gini coefficients for each block, unit housing prices by parcel in a block are used instead of household income in this dissertation research because of their connection to income. Generally, people with higher income have higher priced housing. In contrast, lower income groups usually live in lower priced housing or apartments where quality is not as good as higher priced housing. The data on land parcels from the city of Lincoln (NE) have the information on unit housing price, so that it makes possible to calculate a Gini coefficient to measure housing price inequality as a proxy for income inequality for each block and block group in Lancaster County (NE).

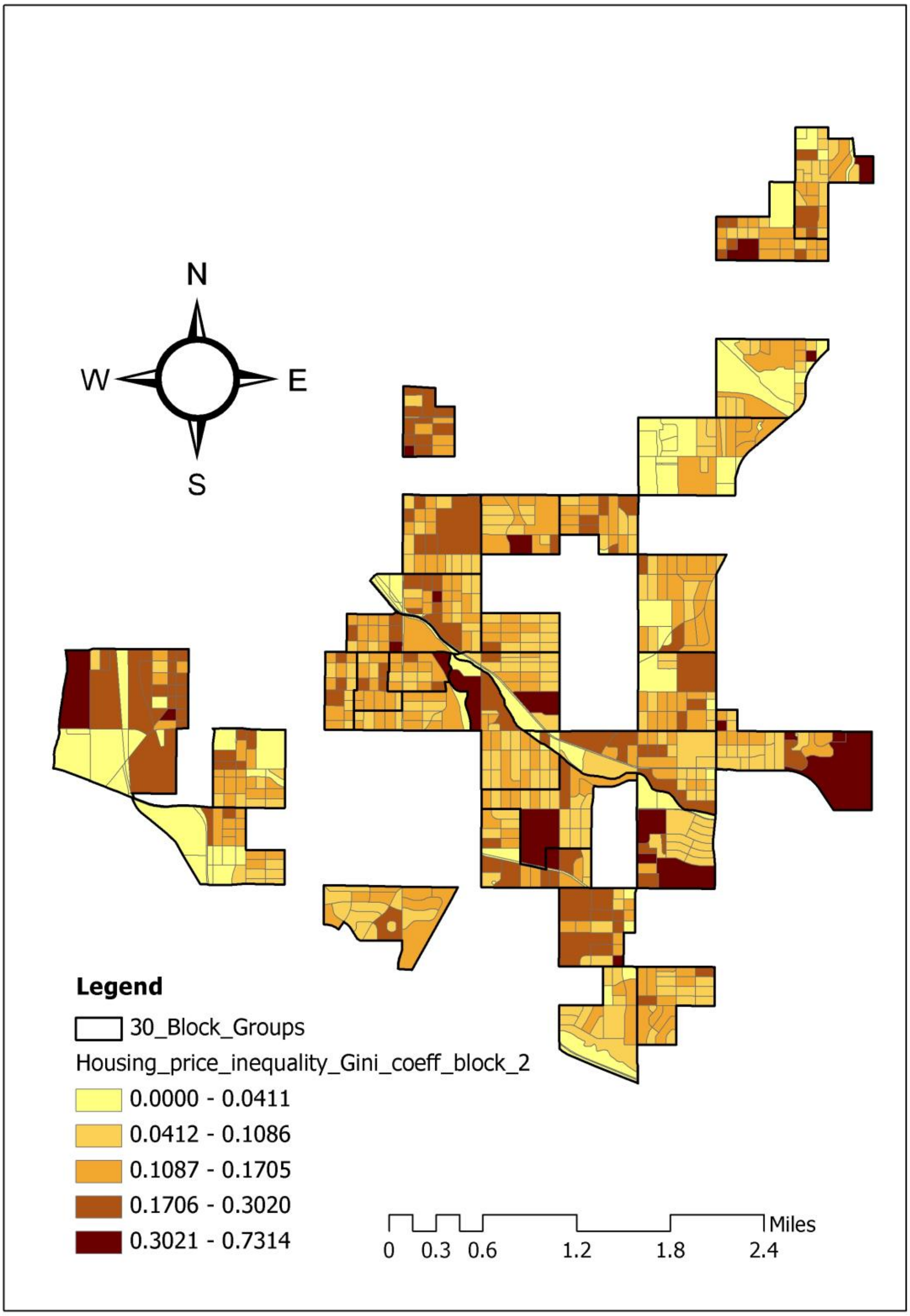


Figure 46. Blocks' Gini coefficients regarding housing price inequality

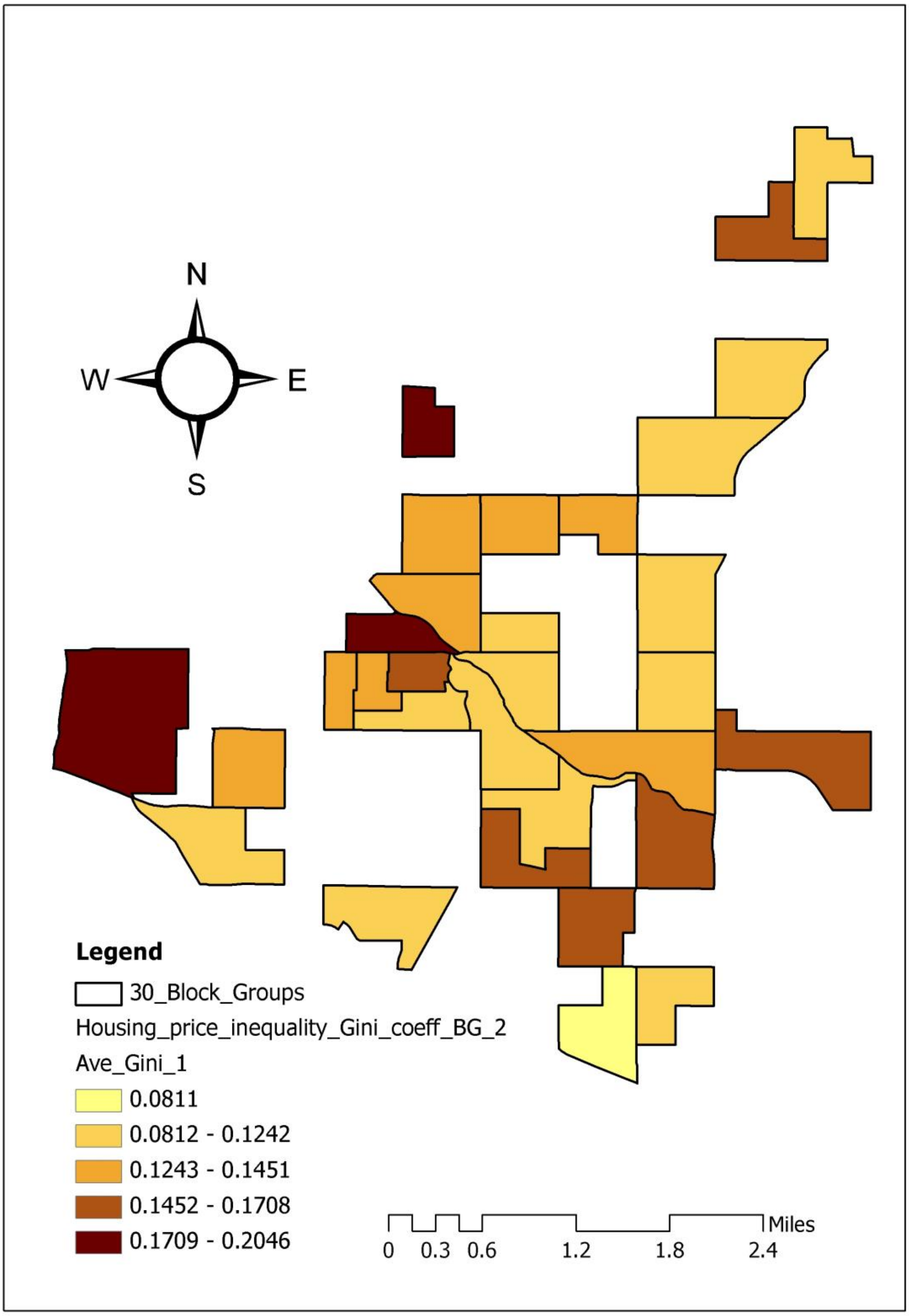


Figure 47. Block groups' Gini coefficients regarding housing price inequality

Homeownership Rate

There are many different kinds of housing units, such as a house, an apartment, a mobile home, etc. If owners live in those units, they are owner-occupied housing units. However, if the owners do not live in the units, those houses are not owner-occupied housing units. The homeownership rate is calculated by the number of owner-occupied housing units divided by the number of total occupied housing units or households (U. S. Census Bureau).

According to Rohe, W. M., Van Zandt, S., & McCarthy, G.. (2013), homeownership is a commitment to strengthening families and good citizenship. Good citizens are supposed to take more responsibility managing their living environment because they want to make a commitment to a community. For example, stabilized neighborhood and strengthened community are what they pursue by making a commitment to a community. In this sense, homeownership is a valid indicator to measure the social status of a community. However, it is just an indirect indicator which does not exactly measure the social status of a community.

Some authors (Rupasingha, A., Goetz, S. J., & Freshwater, D. 2006) have discussed the relationship between homeownership and social capital. According to them, these are closely related to each other. DiPasquale and Glaeser (1999) wrote that “homeowners have an incentive to improve the community where they live in order to protect their investment and because homeownership is a barrier to moving out.” Protecting their investment (i.e., housing units) creates some implicit boundaries to separate neighbors from others; neighbor vs. stranger, in vs. out, including vs. excluding, and the like are the concepts related to the boundaries.

Homeownership is closely connected to several variables which are used to measure good citizenship, such as membership in non-professional organizations or political engagement.

According to Putnam (1996), the number of non-professional organizations that one individual is a member of can be used to measure the level of social interaction (i.e., social capital) between residents in a community. Based on the General Social Survey, the average individual is a member of 1.7 non-professional organizations. Homeowners are members of 1.9 non-professional organizations. However, renters are members of only 1.4 non-professional organizations on average.

Not only that, political engagement also shows the level of good citizenship depending on ownership. DiPasquale and Glaeser (1999) stated that 77 percent of homeowners had participated in voting in local elections. However, only 52 percent of renters had voted in local elections. This shows that homeownership has strong connections with political engagement, which is one of the social capital investments in a community.

Therefore, the indicator of homeownership rate is expected to be a valid one for measuring the level of social capital in a community.

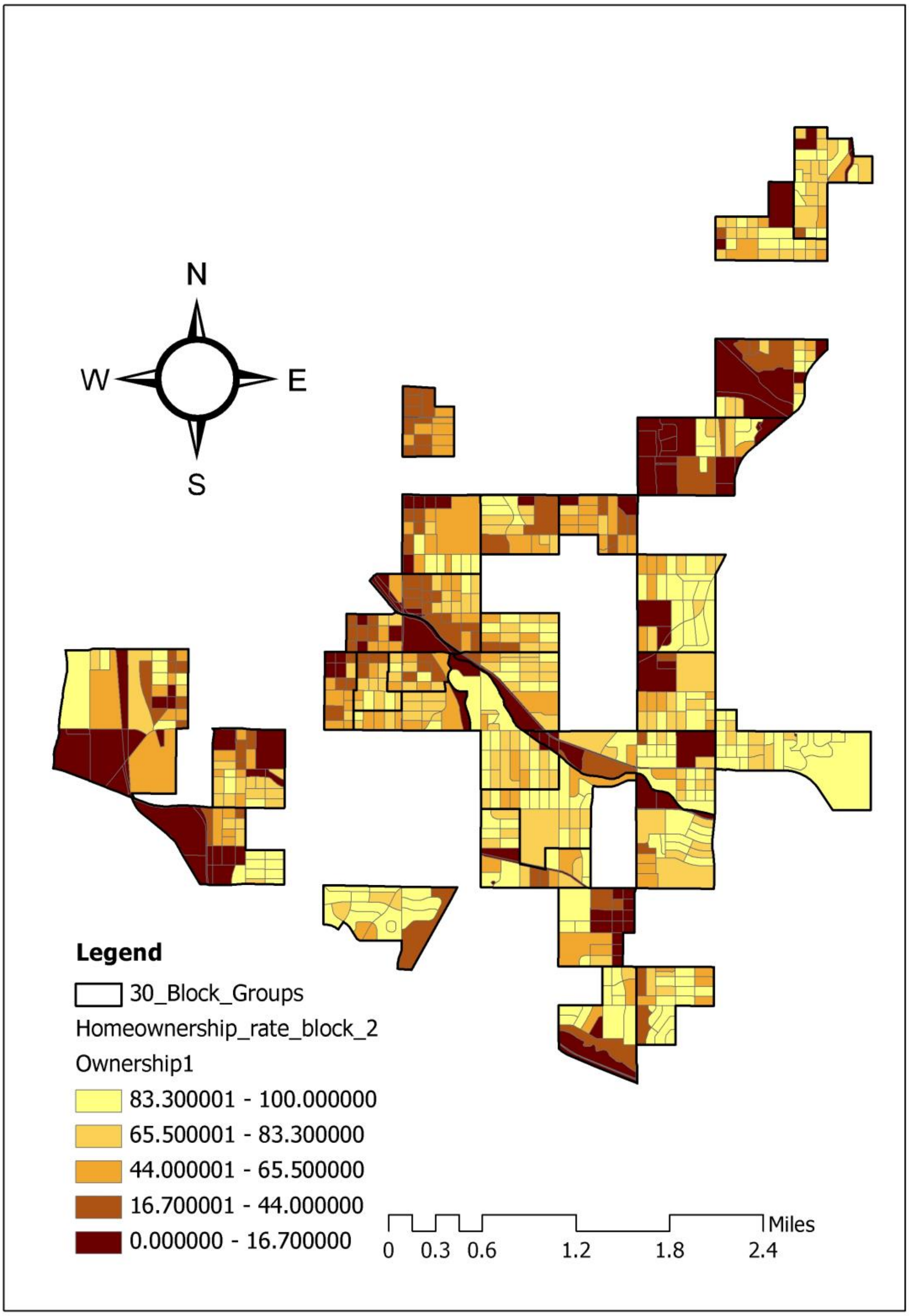


Figure 48. The distribution of blocks based on homeownership rate

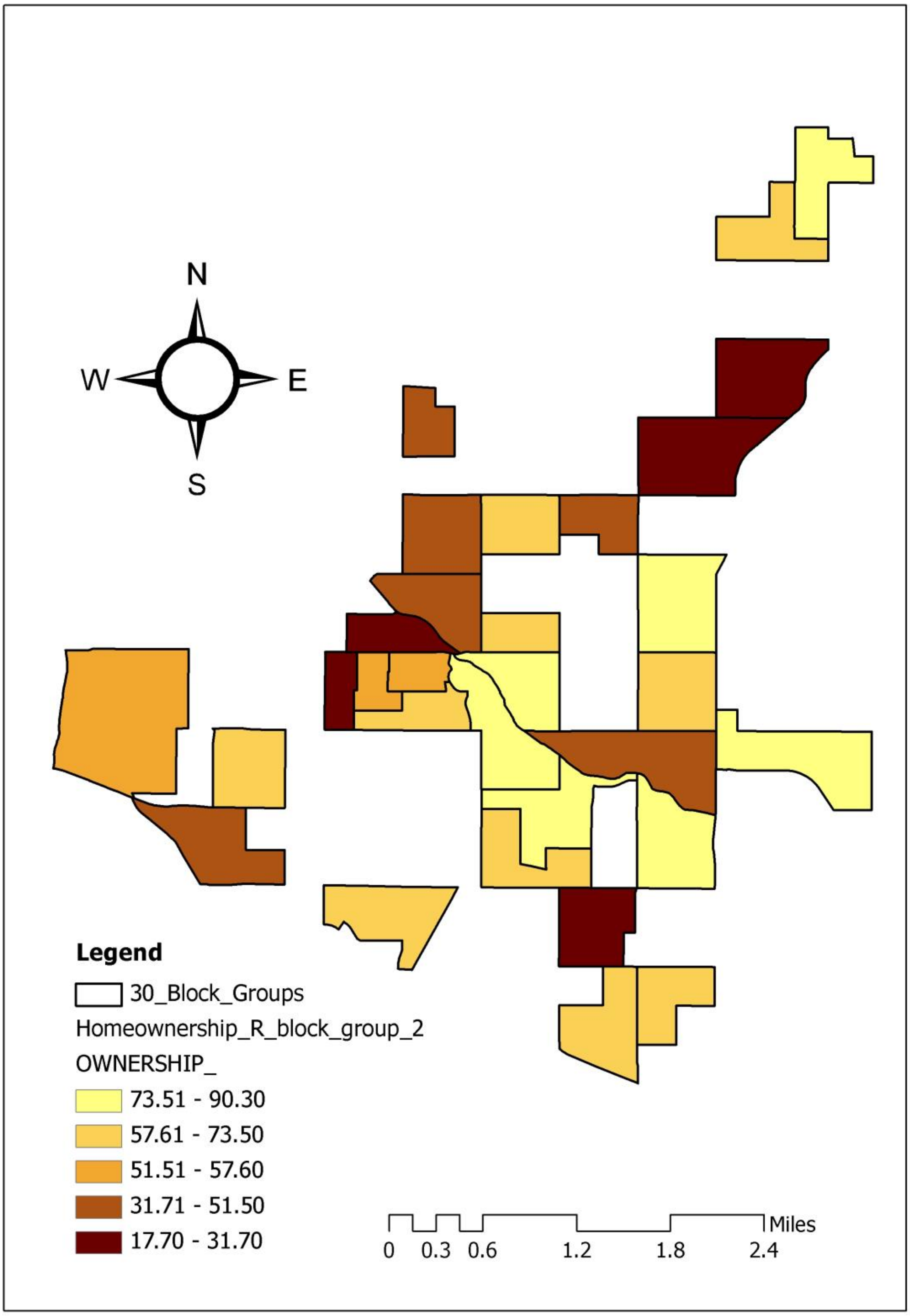


Figure 49. The distribution of block groups based on homeownership rate

Political Participation (Civic Engagement)

Voter Turnout

Social capital refers to connectedness and trust between people within a community. The connectedness and trust between people is improved through social interaction which helps people realize the importance of social outcomes and to set goals for making a livable community by collective actions such as political and civic engagement.

Putnam (1993) mentioned that participation in political and social activities is the primary mean of political and civic engagement. Especially, the following are the usual means of participation in political activities: vote participation, watching political television debates, and supporting a particular political party.

Then, can we expect that connectedness and trust promoted through social interaction can encourage people to participate in the above collective actions (i.e., political and social activities)? People usually tend to trust their neighbor and form closer relationships through social interaction. Without connecting and meeting with their neighbors, it is impossible to form the relationships which are considered as composing social capital. As mentioned earlier, social interaction can help people set goals to improve their neighborhood environment. If they spend more time together (i.e., focusing and working on shared problems in a community), it would be possible for them to set goals for solving the shared problems. In order to achieve their goals for solving the shared social problems, collective actions (i.e., political and social activities) are needed. Social capital, which is described as social interaction or close relationships between people in a community, can help and encourage people to participate in the collective actions to achieve their goals. Thus, according to him (Putnam 1993), we can expect that, if many people participate in political and civic engagement, the level of social connectedness and trust may be higher. A higher level of social capital outcome could help people to set goals and to improve their neighborhood environment.

On the contrary, there is another idea. People may not want to waste their valuable time participating in political and social activities because they do not think those activities provide benefit to people individually. In addition, they might know that it takes a long time for their participation to be effective in improving their community. It leads people to think that their participation in political and social activities has little immediate effect. Thus, some people may refuse to participate in collective activities.

In spite of this uncertainty and vagueness, many authors have argued that there is a connection between social capital and political and social (civic) activities. Especially, Putnam (1995a, 2000) asserted that the erosion of social capital in America is caused by various kinds of factors. Declining rates of political participation is one of them. In a similar vein, Henry E. Brady, Sidney Verba, and Kay Lehman Schlozman (1995) also noted the issue of political participation. According to them, in order to participate in political activities more, respondents are needed to have and to share social outcomes (i.e., social capital) which come from their memberships (jobs, non-profit organizations, churches, etc). Without the sense of belonging to a community, trust, and connectedness, people cannot do anything related to collective actions.

In this dissertation research, thus, based on the assumption that there is a connection between social outcomes (i.e., social capital) and political and social activities, the data on voter turnout (i.e., political engagement) is used as a proxy to measure the level of political engagement in social outcomes. The proportion of the people who had been voting in general and primary election during 1990-2008 to the total population who could vote in a block or a block group is used to show the level of social capital associated with political and civic engagement. Once the voter turnout of each block is calculated, average voter turnout for each block group is calculated. The below figures (Figure 50 and Figure 51) show the distribution of blocks and block groups based on each block and block group’s voter turnout.

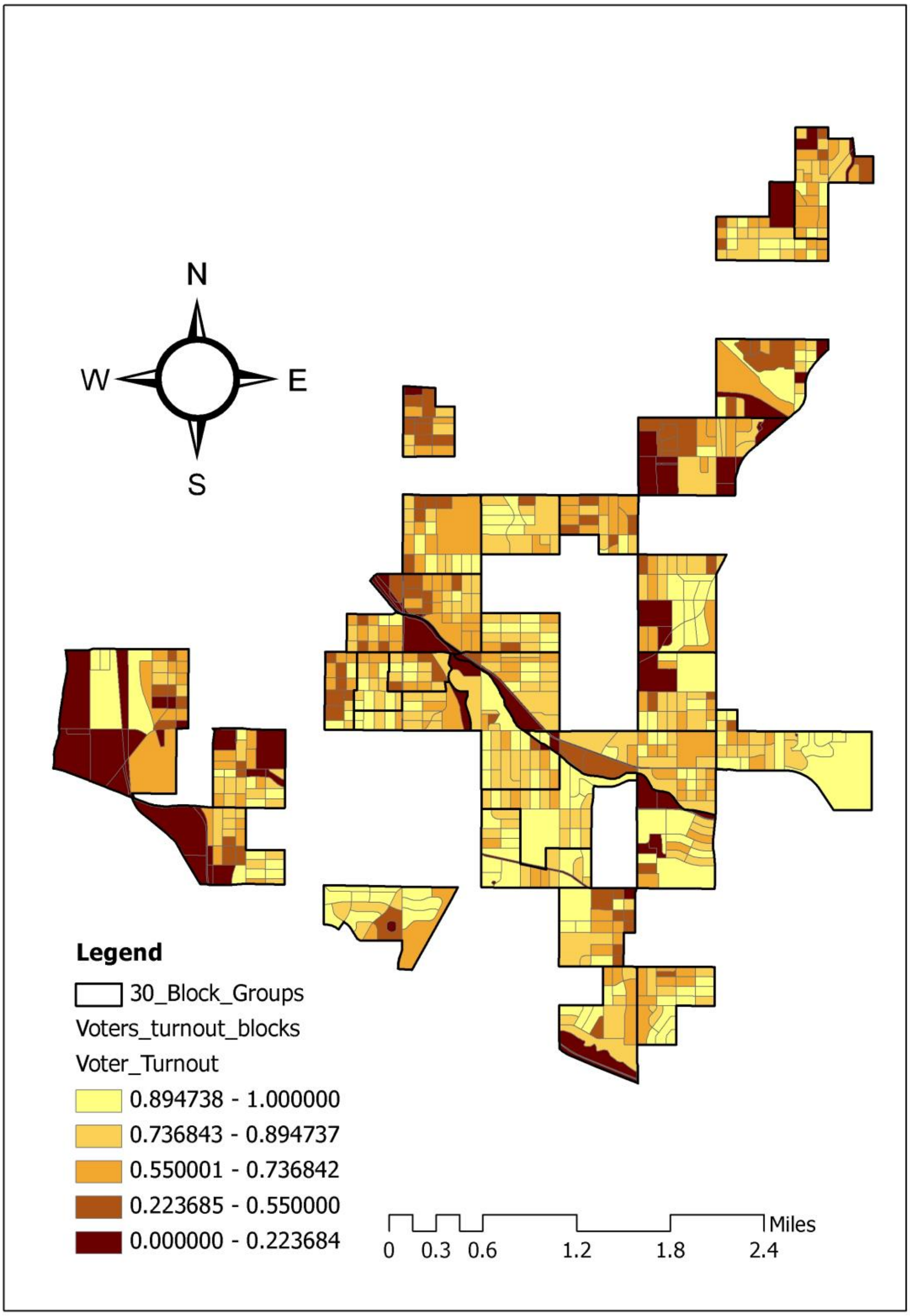


Figure 50. The distribution of blocks based on each block’s voter turnout

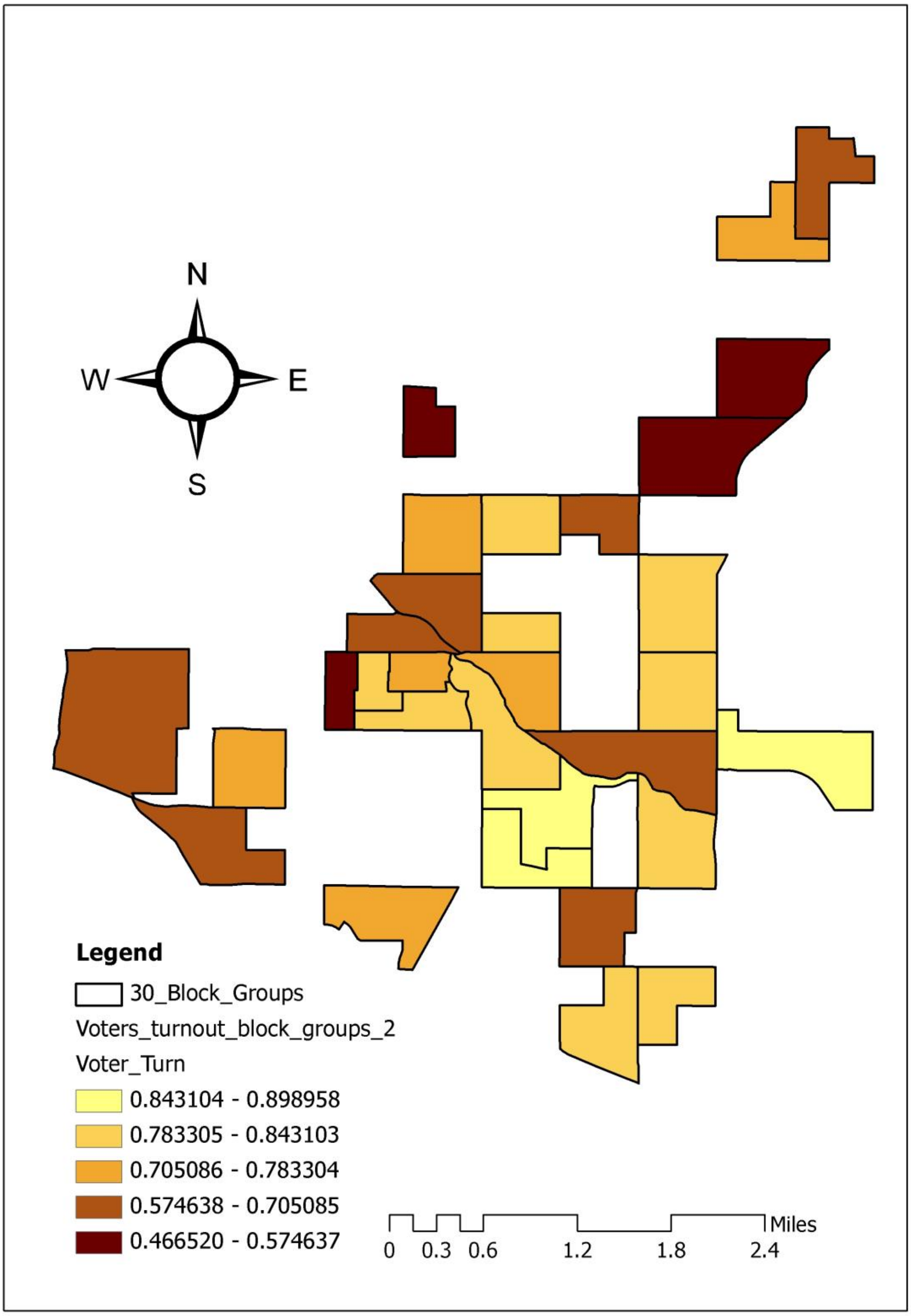


Figure 51. The distribution of block groups based on each block group’s voter turnout

Social Integration (Zenaida R. Ravanera, 2008)

Ravanera and Rajulton (2006) stated that in order to understand the meaning of integration (i.e., economic integration, political integration, and social integration), we have to understand the concept of social cohesion, because integration is social cohesion viewed at the individual level. Soroka, Johnson and Banting (2007) discussed three approaches to identify and define the concept of social cohesion. First, focusing on norms, shared values and common sense of identity is one of the approaches. The second approach is to focus on active social or political engagement and participation. The latter is related to social capital which is based on social networks and norms of trust.

In this dissertation research, the first approach will be applied to identify and define the concept of social cohesion due to the connections between the indicators. For example, the issue of ethnic division and social mobility is related to a common sense of identity. Norms and shared values are often mentioned when discussing crime rate or social status.

Then, it is possible to grasp the meaning of social integration at the individual level. With regard to the first approach, the indicators used to measure the relative level of social cohesion of a community are ethnic division, non-family status, social mobility, and crime rates. Although these are indirect indicators, they help to measure the level of social cohesion, social integration, and social capital.

Ethnic Diversity

Putnam (1995) argues that racial differences have contributed to an erosion of social capital in America. According to Alesina et al (1999), participation in associational activities is significantly lower in ethnically fragmented communities. Alesina et al

(1999) used the ethnic fractionalization index to measure ethnic diversity in a county. In this dissertation research, the ethnic fractionalization index is also used to measure racial differences in each block and block group.

$$ef = 1 - \sum_{i}(Race_i)^2$$

Figure 52. The equation of the ethnic fractionalization index

ef: ethnic fractionalization level

$Race_i$: the share of population self-identified by race i=(White, Black, Asian and Pacific Islander, American Indian, other)

(Sources: Alesina et al. (1999). Page 228)

If, for example, the shares of population self-identified by races are as follows: the share of white people in a block (or block group) is 0.7, that of Black people is 0.05, Asian and Pacific Islander is 0.05, American Indian is 0.1, and the share of other people in the block (or block group) is 0.1. Then, the level of ethnic fractionalization is calculated as follows.

$$\begin{aligned} ef &= 1 - [(0.7)^2 + (0.05)^2 + (0.05)^2 + (0.1)^2 + (0.1)^2] \\ &= 1 - [0.49 + 0.0025 + 0.0025 + 0.01 + 0.01] \\ &= 1 - [0.515] = 0.485 \end{aligned}$$

Figure 53.1 An example of the calculation for the level of ethnic fractionalization

Here is another example. If, the share of white people in another block (or block group) is 0.25, the share of black people is 0.25 (the same as the share of white people), Asian and Pacific Islander is 0.2, American Indian is 0.2, and other people in the block (or block) have the share of 0.1. Then, based on these shares, the ethnic fractionalized level for the second block (or block group) is 0.785.

$$ef = 1 - [(0.25)^2 + (0.25)^2 + (0.2)^2 + (0.2)^2 + (0.1)^2]$$
$$= 1 - [0.0625 + 0.0625 + 0.04 + 0.04 + 0.01]$$
$$= 1 - [0.215] = 0.785$$

Figure 53.2 An example of the calculation for the level of ethnic fractionalization

These two calculations and numerical share values (Figure 53.1 and Figure 53.2) show that the second block (or block group) has a higher level of ethnic fractionalization than the first block (or block group). As we know, the first community which could be a block or block group is not as diverse in terms of races. The majority population in the community is white people (70%). The percentage of other races including black people, Asian, American Indian, etc is just 30 %. However, the second community is a block or a block group of many races. The community is ethnically diverse: white people (25%), black people (25%), Asian and Pacific Islander (0.2), American Indian (0.2), and other people (0.1). A community with a higher numerical value of ethnic fractionalization is much more fractionalized ethnically.

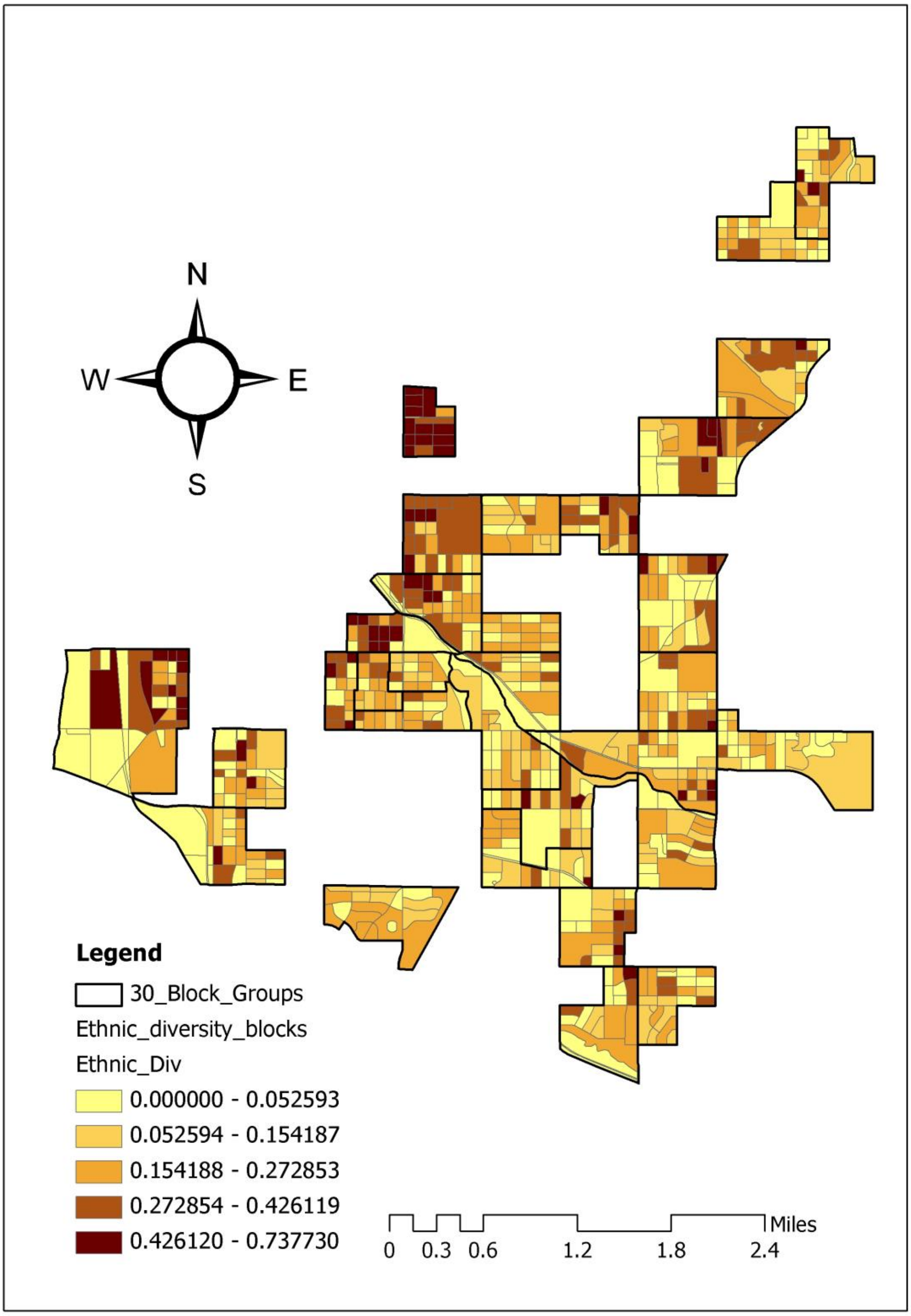


Figure 54. Distribution of blocks based on the value of ethnic fractionalization

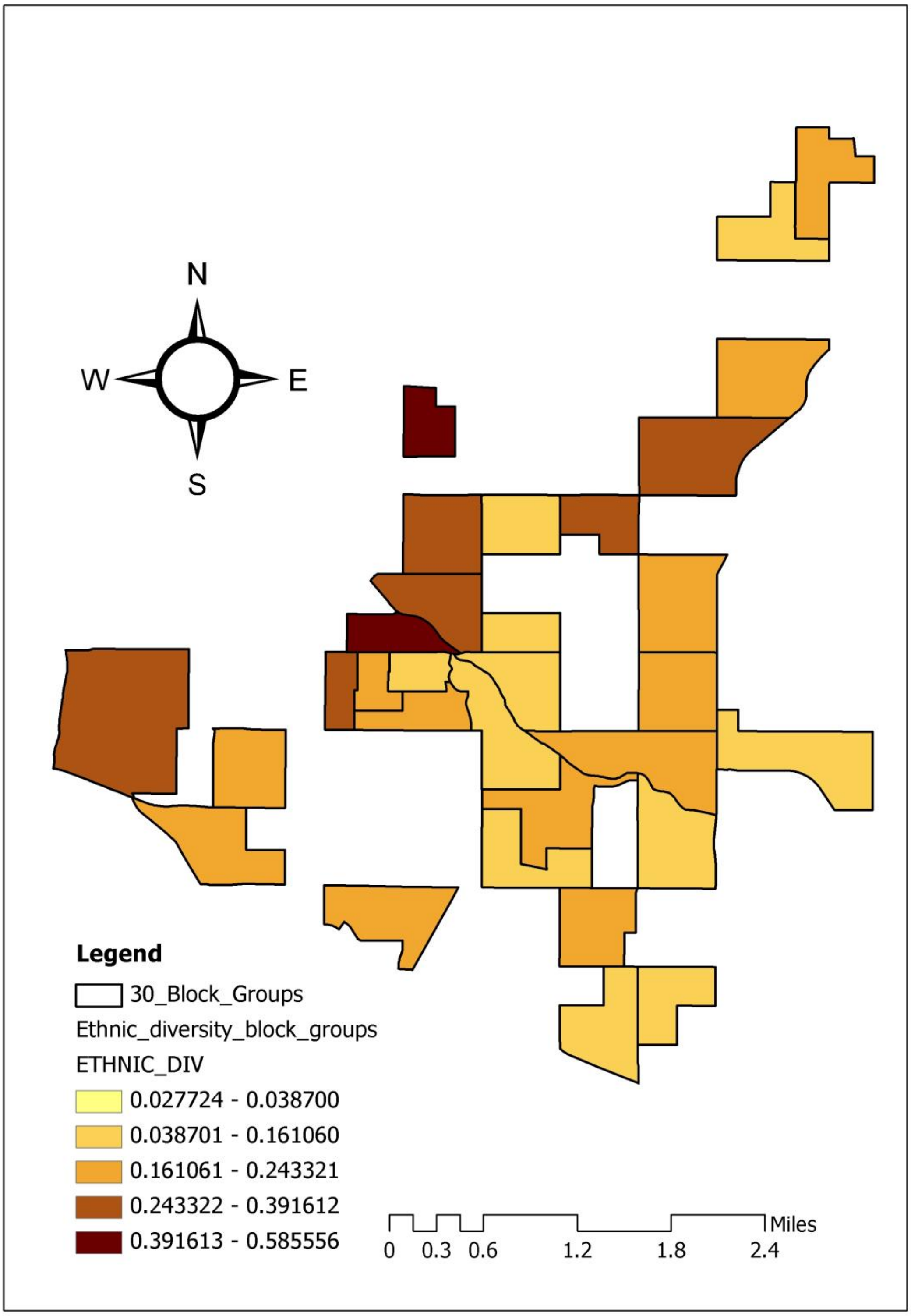


Figure 55. Distribution of block groups based on the value of ethnic fractionalization

Family Status (Marriage)

Putnam (1995) mentioned that "Another widely discussed social trend that more or less coincides with the downturn in civic engagement is the breakdown of the traditional family unit - mom, dad, and the kids." It has been cited as negatively affecting the production of social capital. According to him, a key form of social capital is the traditional family unit itself. However, the percentage of one-person households and single-parent families has been increasing. The divorce rate increased rapidly during the mid-1960s to the mid-1970s. In the 1990s, the percentage of single-parent families and one-person households had doubled since the 1950s. Putnam (1995) also states that the net effect of these changes of increased divorce rates, high percentage of single-parent families and one-person households is that "the proportion of all American adults who are currently unmarried climbed from 28% in 1974 to 48% in 1994." We can infer that all American adults who are currently unmarried have something to do with the breakdown of the traditional family unit. Breakdown of the traditional family unit and weak family bonds may be causing all American adults who are currently unmarried to be hesitant about marriage.

The point is, people who are currently unmarried have different levels of trust and civic engagement. According to Putnam (1995), married people have higher levels of civic engagement and they are more trusting than unmarried people. In his research, married people are about a third more trusting than unmarried people. In addition, married people are likely to participate in 15 – 25% more groups than unmarried people. Putnam (1995) mentioned that "successful marriage is statistically associated with greater social trust and civic engagement. Thus, some part of the decline in both trust and membership is tied to the decline in marriage." Marriage, maintaining the traditional family unit, is a very direct indicator showing the level of social capital.

And, married people have higher levels of social capital than single men or women. Thus, the proportion of family households to total families in each block (block group) is used as a proxy measure of the level of social capital in terms of social trust and civic engagement. The below figures (Figure 56 and Figure 57) show the distribution of blocks and block groups based on the rates of family households for each block and block group.

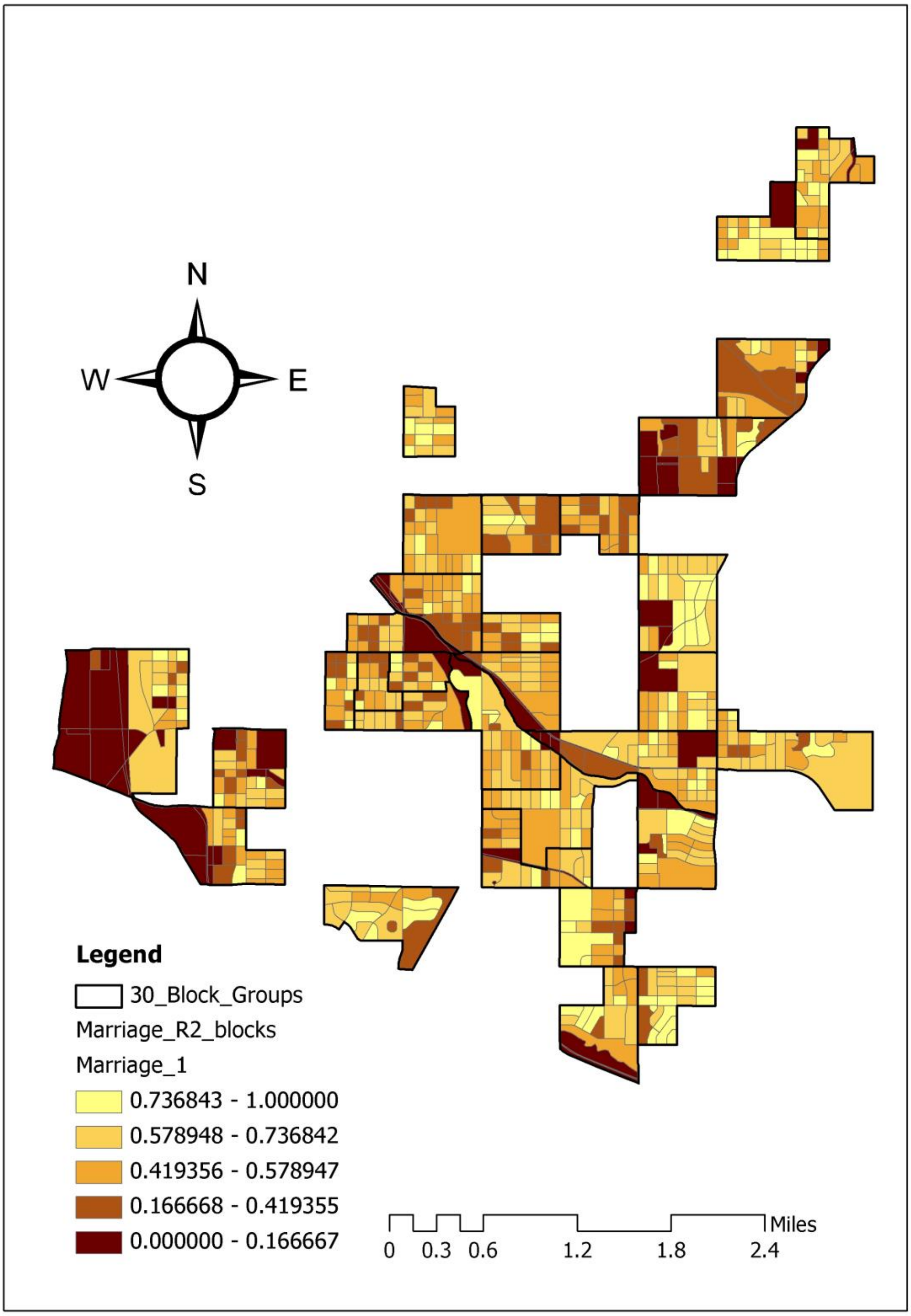


Figure 56. Distribution of blocks based on the rate of family households

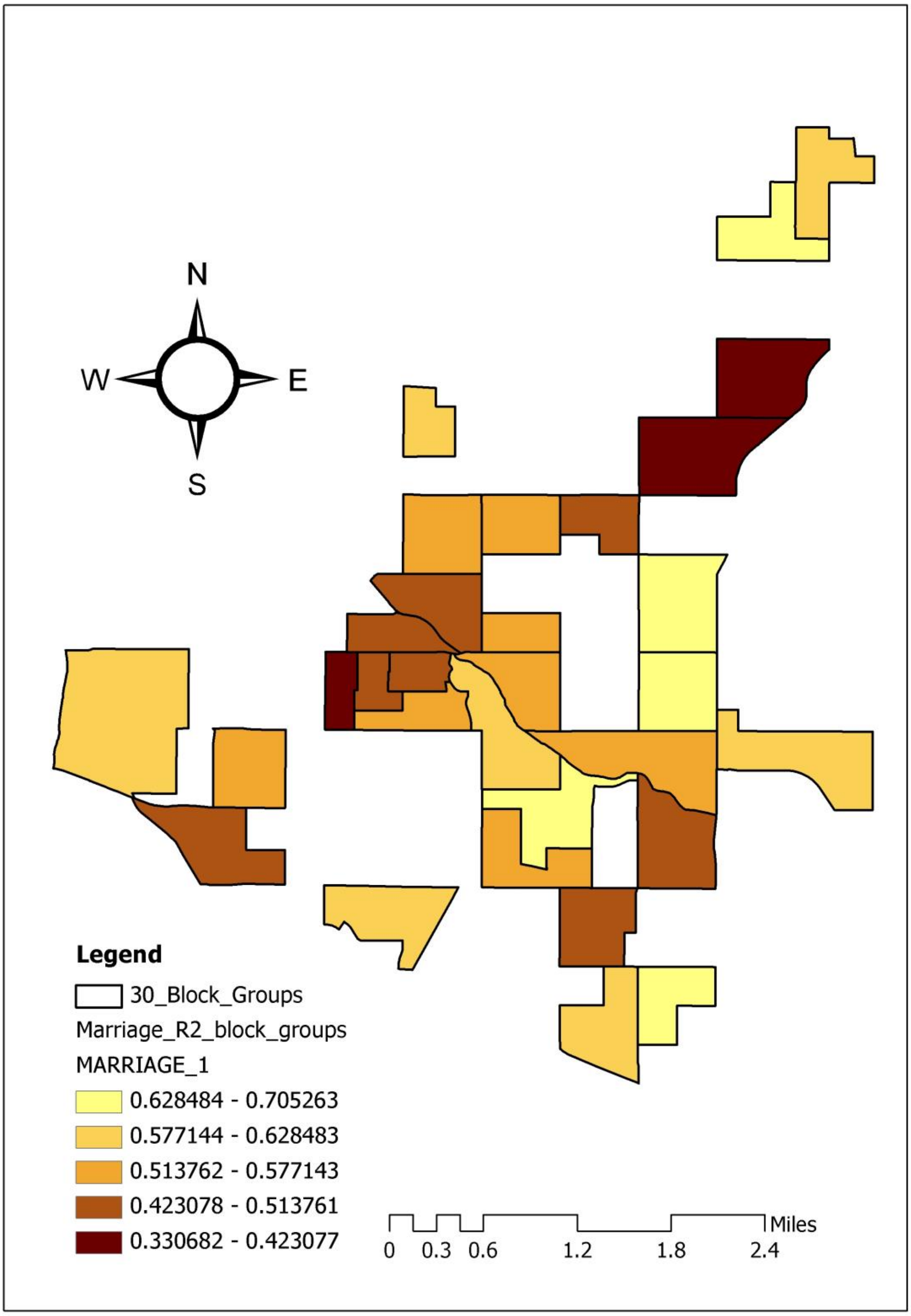


Figure 57. Distribution of block groups based on the rate of family households

Family Status (Own Children under 18 Years Old)

According to Putnam (1995), the breakdown of the traditional family unit has been negatively affecting the production of social capital. The traditional family is the unit composed of family members: dad, mom, and children.

With regard to the family member of children, some authors mentioned that child rearing activities are affecting negatively to form social capital in a community because they may not spend much time with their neighbors due to child rearing (Alesina and La Ferrara, 2000). In contrast, if families have their own children, this will allow them to have social interactions because they share common interests such as child rearing activities, education, food and nutrition, etc. Thus, the average number of children per family or checking whether or not families have their own children under 18 years are included to test the possibility that having own children affects the level of social capital.

In this dissertation research, the proportion of the family households (husband-wife family, male householder and no wife family, and female householder and no husband family) with children under 18 years to total households in each block (or block group) is used to measure the level of social capital.

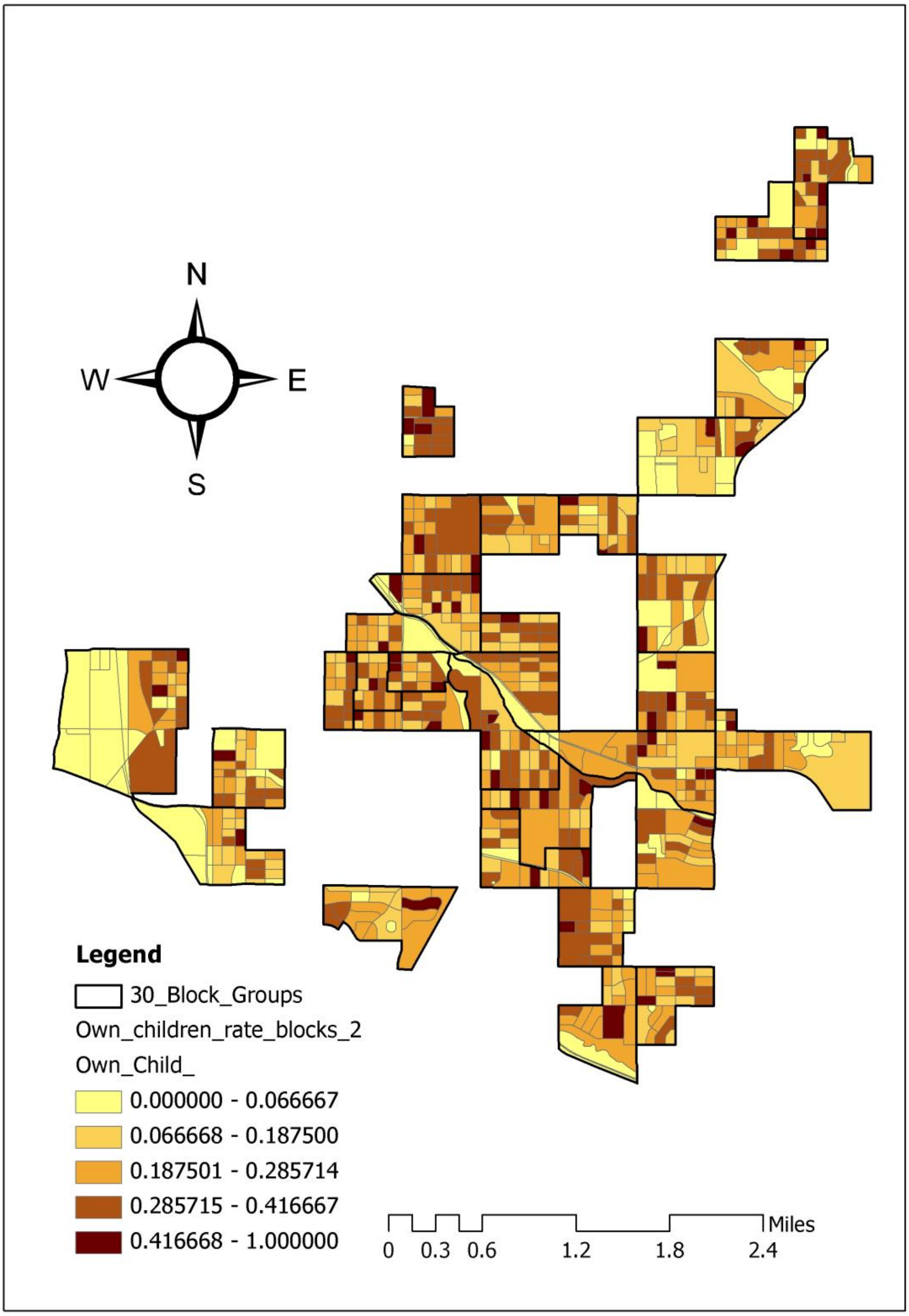


Figure 58. Distribution of blocks based on the rate of family households with children under 18 years

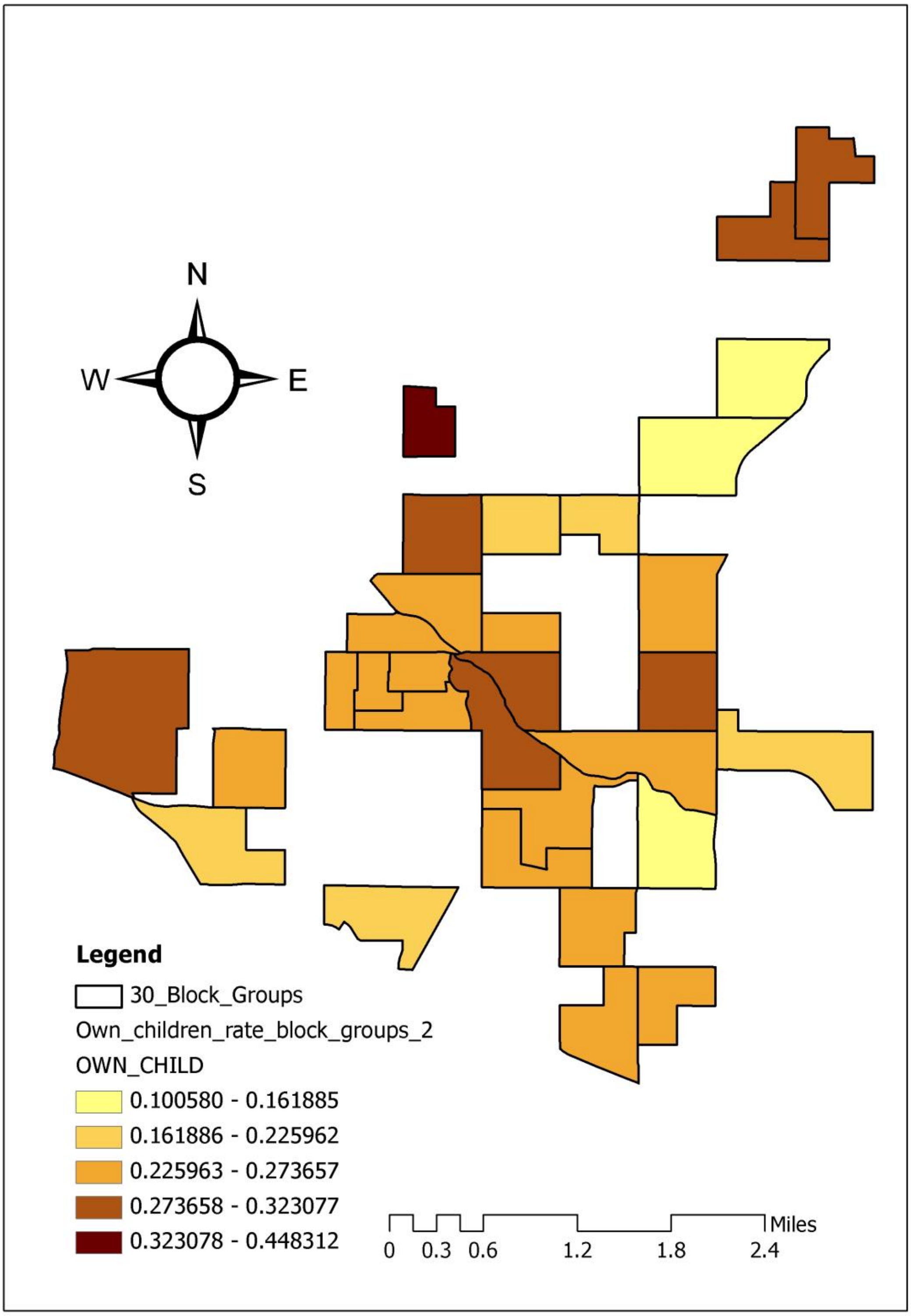


Figure 59. Distribution of block groups based on the rate of family households with children under 18 years

Social Mobility (Community Attachment)

Frequent migration, moving in or moving out a community, reduces social capital levels because residents believe that migration will negatively affect interpersonal relationships and trust among community members. Frequent migration seems to weaken local networks and associations (Glaeser et al., 2000).

Social mobility (i.e., community attachment) which is indicated by residential stability is associated with civic engagement. According to Putnam (1995a), “mobility, like frequent repotting of plants, tends to disrupt root systems, and it takes time for an uprooted individual to put down new roots.” Especially the data from U.S. Bureau of the Census shows that rates of residential mobility have declined over the last five decades. In 1950s, the rate (20%) of residential mobility (the percentage of total population in United States who changed their residences each year) has declined to 17% in 1990s. Also, 6.9% of Americans moved across county borders each year in the 1950s but declined to 6.6% in the 1990s.

Actually, a person who recently moved into a community may be regarded as a stranger because residents in the community do not want to share valuable information with the stranger for a while. However, when he/she (i.e., the stranger) becomes familiar with neighbors to the level of having a simple social interaction, they might think that it is time for them to open their hearts to the new person. And they build up new interpersonal relationships and start trusting each other. It takes long time for people to regard a relationship to be good enough for sharing information related to political and civic engagement. Thus, we can think that frequent migration negatively affects social capital and makes it difficult to establish trust.

We obtained data from the Lancaster Election Commission. The data on voter turnout has information about date of residency. It tells us how long each household has lived in their houses based on the equation shown in Figure 60. Actual information on the date of residency gives the year when they moved into the residence.

$$\text{Social Mobility} = 2013 - \text{DOR (date of residence)}$$

Figure 60. The equation of social mobility

For example, a householder who moved into a unit in the year of 2000 would be indicated by the equation (Figure 60) as residing in the same unit for 13 years.

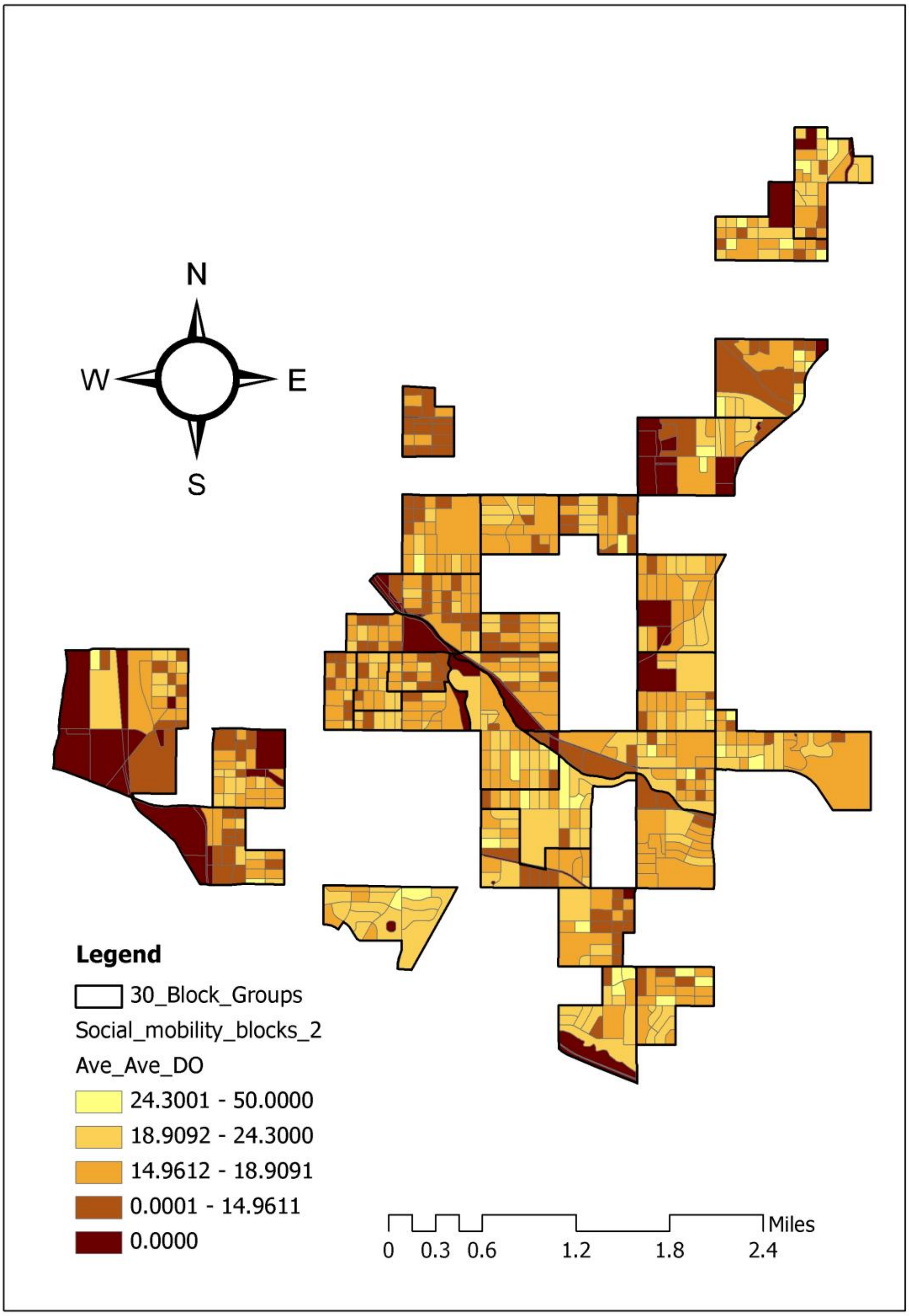


Figure 61. Distribution of blocks based on social mobility

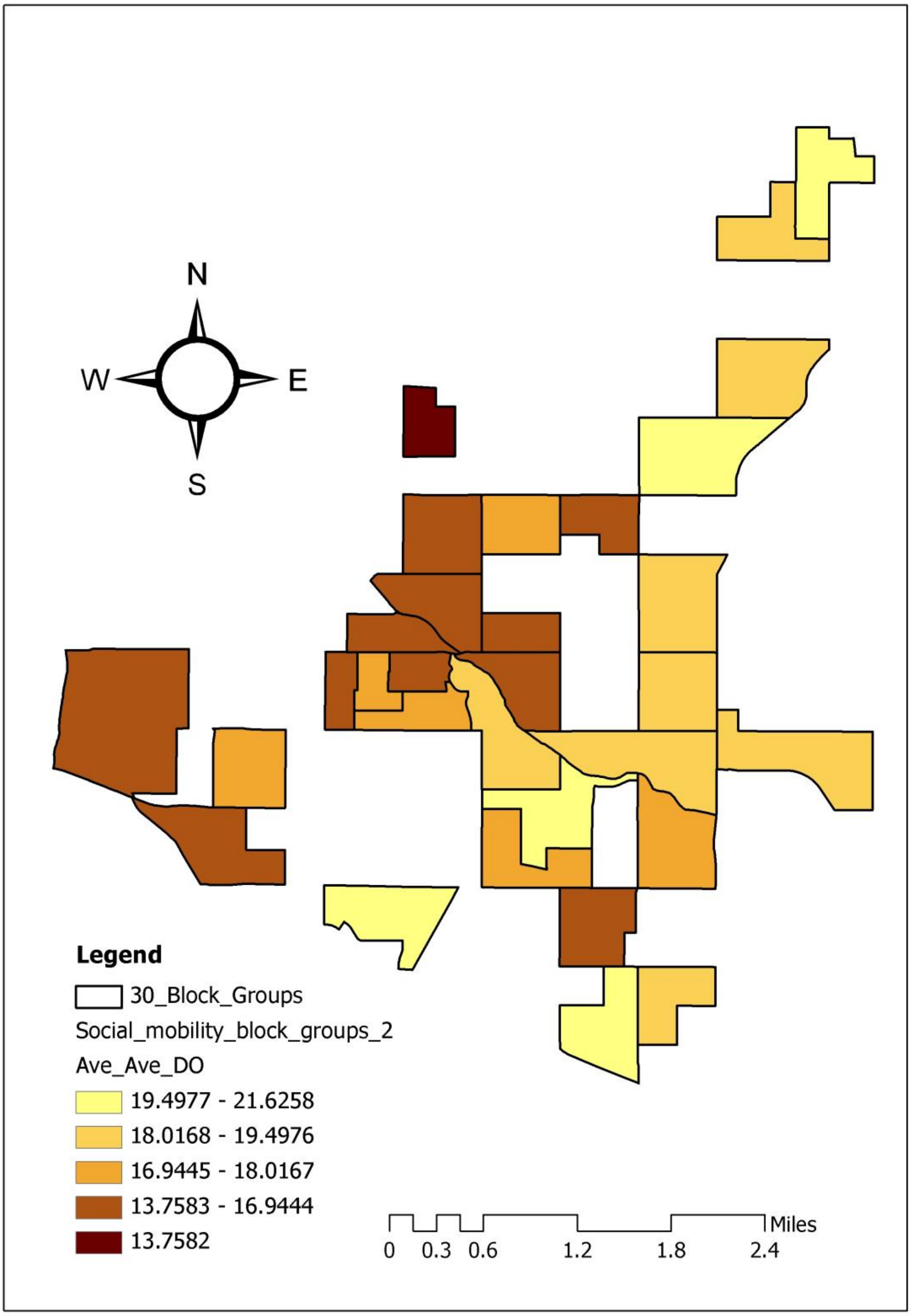


Figure 62. Distribution of block groups based on social mobility

Crime

Generally, communities with higher levels of social capital have lower crime rates. Assault mortality, criminal victimization, fear of crime, and road casualties are the result of criminal events. Then we can think about factors related to criminal events. One of the factors considered is low level of social capital.

Many researchers have been studying the connection between crime rates and the level of social capital. Some authors (Akçomak, İ. S., & ter Weel, B. 2012) argued that "differences in social capital can account for a significant part of the observed differences in crime rates across cities." According to them, people usually mimic a series of behaviors of peers or others surrounding them in a community while having relationships. Besides, when an individual is being involved in a criminal event, peers and his/her family (or community) will punish or guide him/her in the right direction. So, he/she will be less likely to commit crime because of the social interaction. People in a community are affecting each other in a positive way and negative way. However, if one individual decides not to commit crime, it makes other people less likely to commit crime as well because of the informal social control.

The 'informal social control', which is mentioned in another research (Akçomak, İ. S., & ter Weel, B. 2012), is getting to be considered as among community-oriented solutions to solve crime problems because formal regulations or institutional strategies are not good enough to eradicate criminal events. In order to solve crime problems, making a consensus between residents to set a goal and having an understanding about process for a crime-free society are necessary because the informal social control will increase the level of trust, civic engagement, the sense of belonging to a community, altruistic behavior, etc.

The Federal Bureau of Investigation (FBI) conducts a crime reporting program which is the Uniform Crime Reporting program. Every year, crime statistics, definition of crimes, and classification of crimes are stated in this program. According to the program, crimes are classified into two types: Part 1 and Part 2 offenses. Part 1 offenses are serious crimes and Part 2 offenses are less serious ones. UCR (i.e., Uniform Crime Reporting) program collects the data on Part 1 offenses which are used to measure the level and scope of Part 1 offenses across the nation because the Part 1 crimes are more serious and may occur more often in a community.

<table>
<tr><th colspan="2">Category</th><th rowspan="2">Description</th></tr>
<tr><th colspan="2">Part 1 Offenses</th></tr>
<tr><td rowspan="4">Personal/Violent Crimes</td><td>Aggravated assault</td><td>Unlawfully attacking another person to inflict severe or aggravated bodily injury, usually accompanied by the use of a weapon or by other means likely to produce death or grave bodily harm. Attempted aggravated assault that involves the use or threat of use of a gun, knife or other weapon is included in this crime category because serious personal injury likely would result.</td></tr>
<tr><td>Forcible rape</td><td>The “carnal knowledge of a female forcibly and against her will.” UCR includes assaults and attempts to commit rape by force or threat of force but excludes statutory rape (without force) and other sex offenses. UCR collects data only on the rape of women.</td></tr>
<tr><td>Murder</td><td>Killing a human in a willful and non-negligent manner.</td></tr>
<tr><td>Robbery</td><td>Taking or attempting to take anything of value from a person by force or threat of force or violence.</td></tr>
<tr><td rowspan="4">Property Crimes</td><td>Arson</td><td>Willfully or maliciously burning or attempting to burn, with or without intent to defraud, a house, public building, motor vehicle, aircraft or personal property.</td></tr>
<tr><td>Burglary</td><td>Unlawfully entering a structure to commit a felony or theft. Forcible entry need not have occurred.</td></tr>
<tr><td>Larceny-theft</td><td>Unlawfully taking property from another (e.g., stealing a bicycle, stealing automobile parts, shoplifting, pickpocketing) without force, violence or fraud. Attempted larcenies are included.</td></tr>
<tr><td>Motor vehicle theft</td><td>The theft or attempted theft of a motor vehicle.</td></tr>
</table>

Table 23. Classification of Part 1 offenses
(Sources: Crime in the United States 2011, http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2011/crime-in-the-u.s.-2011/offense-definitions,
FBI (Federal Bureau of Investigation) Uniform Crime Report-Offense Definitions)

Part 1 offenses are divided into 2 types of crimes: Personal/violent crimes and property crimes. Fear of crime described by the severity of crime is measured by two indicators in this dissertation research: crime incidence (i.e., the number of occurrences of Part 1 offenses) in a community and total amount of loss and damage caused by the Part 1 offenses.

In order to measure crime incidence for a block (or a block group), the average number of Part 1 offenses which occurred in the block (or the block group) is normalized by the population of the block (or the block group).

Besides, among Part 1 offenses, ‘personal/violent crimes’ are mostly related to personal injury. However, ‘property crimes’ which is the other type of Part 1 offenses are closely associated with monetary issues. The total amount of loss and damage caused by Part 1 offenses are calculated to show the severity of criminal events by blocks (block groups). In the same manner with calculating the average crime incidence of a community, the total amount of loss and damage caused by criminal events is normalized by the population of a block (or a block group). Otherwise the total amount of loss and damage of a community will depend on the number of population of a community (block or block group) because there are generally a lot of criminal events in a big community compared to a small community. Therefore, normalization by the population of a community (i.e., block or block group) is required to measure severity of crimes in terms of incidences and total amount of loss and damage.

Part 2 offenses are less serious crimes. They are just misdemeanors, such as “mother does not care about grandparent,” “not giving a ride to children,” “threatening by sending text messages,” etc. In the second data set, Part 1 and Part 2 offenses are handled together. Total crime incidence in a community and total amount of loss and damage caused by the Part 1 and Part 2 offenses are measured together to examine severity of all crimes by a block or a block group. In the same manner with the method to measure the values of two indicators, total crime incidence and total amount of loss and damage are normalized by the population of a community. Table 24 below show the types of Part 2 offenses and descriptions.

Category Part 2 Offenses	Description
Curfew violation/loitering	Curfew violation sometime is classified as a status offense (one only juveniles can commit). Loitering involves spending an excessive amount of time in a particular location without being able to justify one's presence when questioned by authorities. Loitering frequently occurs in conjunction with curfew violations.
Disorderly conduct	Acting in a manner potentially threatening to oneself or to other people. Disorderly conduct laws sometimes overlap with public drunkenness laws.
Driving under the influence	Operating a motor vehicle while under the influence of alcohol or narcotics. Each state sets an acceptable blood-alcohol level for drivers.
Drug law violations	Violating any local, state or federal drug law that prohibits the possession or sale of specific drugs or drug paraphernalia.
Embezzlement	Misappropriating money or property by a person entrusted with it for personal use and benefit.
Forgery and counterfeiting	Forgery involves creating or altering a written document in such a way that another person's rights are compromised. Counterfeiting occurs when a person copies or imitates an item without authorization and passes off the copy as the genuine or original thing. While counterfeiting is most often associated with money, it also can be applied to designer clothing and accessories.
Fraud	The intentional deception by one party in order to wrongfully obtain possession or control of money, goods or specific rights belonging to an innocent party.
Gambling	Violating any local, state or federal law that prohibits gambling.
Liquor-law violations	Selling alcohol without a valid liquor-serving license or failing to check the identification of all people seeking to purchase alcohol on a premises.
Offenses against the family (e.g., nonsupport)	The failure of one or both parents to provide for their children.

Category Part 2 Offenses	Description
Prostitution and related offenses	Offering to exchange sexual favors for money, drugs or other goods or providing such favors.
Public drunkenness	Being inebriated in public for an extended period of time. Blood-alcohol levels are set forth to govern such violations in each state. Laws also dictate when and where people may carry around alcohol in open containers.
Runaways	States usually classify running away from home as a status offense that can be committed only by juveniles. The Justice Department's Amber Alert program seeks to help communities start searches for children when there is any suspicion they are in danger and have not left home voluntarily.
Sex offenses (e.g., statutory rape)	An adult having sex with a child or teen who cannot legally consent to the act.
Simple assault	Attempting to inflict physical harm on another person when that person is aware. Assault can be both a criminal and civil wrong, redressed by either criminal punishment or damages. Battery has generally been defined as the unlawful touching of another person. However, many jurisdictions no longer observe this distinction.
Stolen property (mishandling of)	Selling or purchasing goods stolen from another person or entity.
Vandalism	Damaging or defacing public or private property without permission.
Weapons (e.g., unlawful carrying of)	Carrying a concealed weapon without the proper license or permit; fraudulently obtaining a gun, license or ammunition; or possessing a type of gun or assault weapon that the public is not authorized to own, carry or use.
Vagrancy	Failing to maintain a verifiable mailing address and spending excessive time wandering around in public.

Table 24. Classification of Part 2 offenses
(Sources: Crime in the United States 2011, http://www.fbi.gov/about-us/cjis/ucr/crime-in-the-u.s/2011/crime-in-the-u.s.-2011/offense-definitions,
FBI (Federal Bureau of Investigation) Uniform Crime Report-Offense Definitions

We have 4 years crime data: 2008, 2009, 2010, and 2011. They are from Lincoln Police Department in Nebraska. The 4 years crime data provides information regarding crime type, location, date, loss and damage, specific description, and so on. The following figures (Figure 63 and Figure 64) show how the Part 1 and Part 2 (two types: 'personal/violent crimes' and 'property crimes') offenses are distributed in the Lancaster County (NE). And the next figures (from Figure 65 to Figure 72) shows the distribution of blocks and block groups based on total crime incidence and total amount of loss and damage by Part 1 and all offenses for each block and block group.

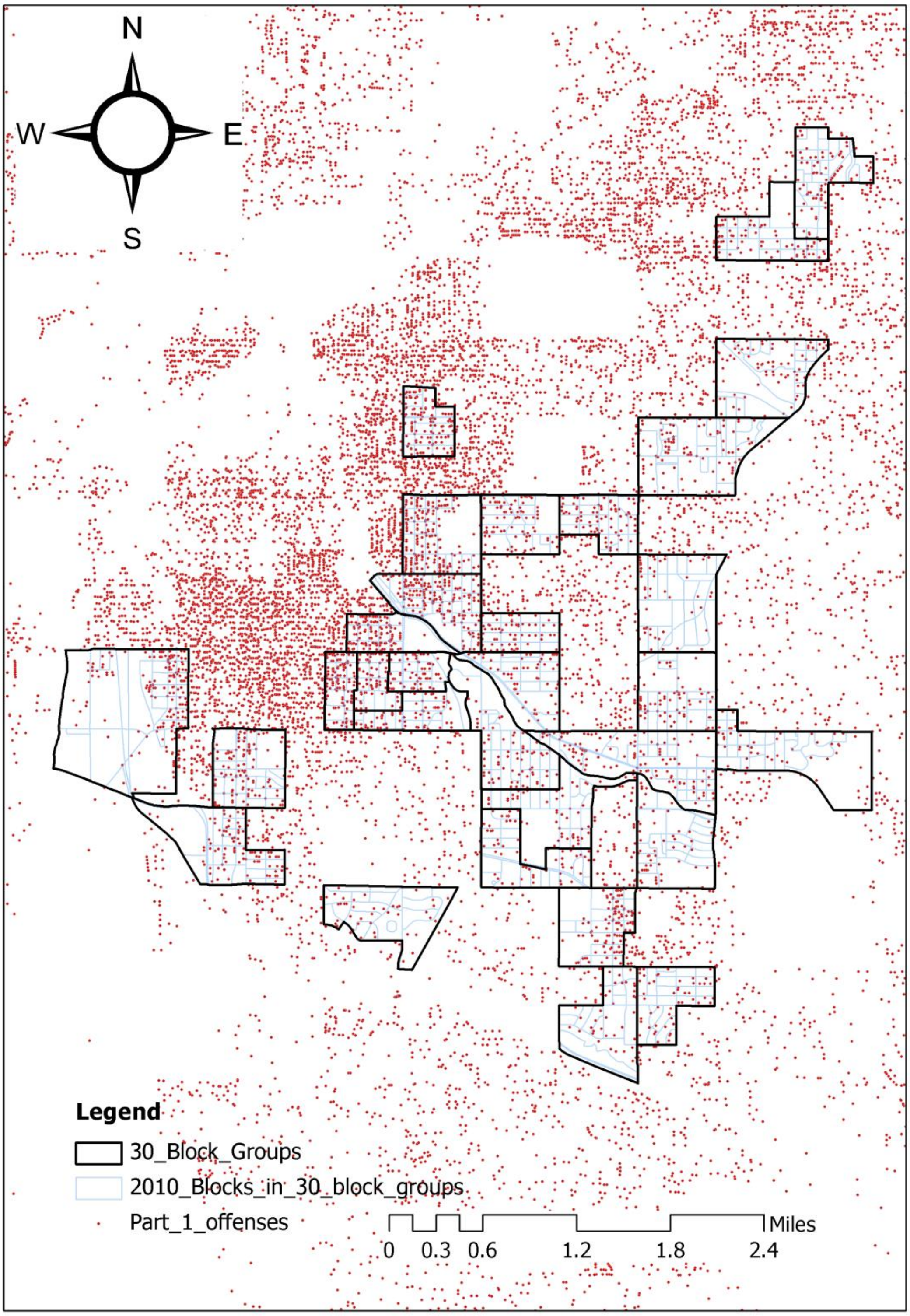


Figure 63. Distribution of Part 1 offenses in Lancaster County (NE)

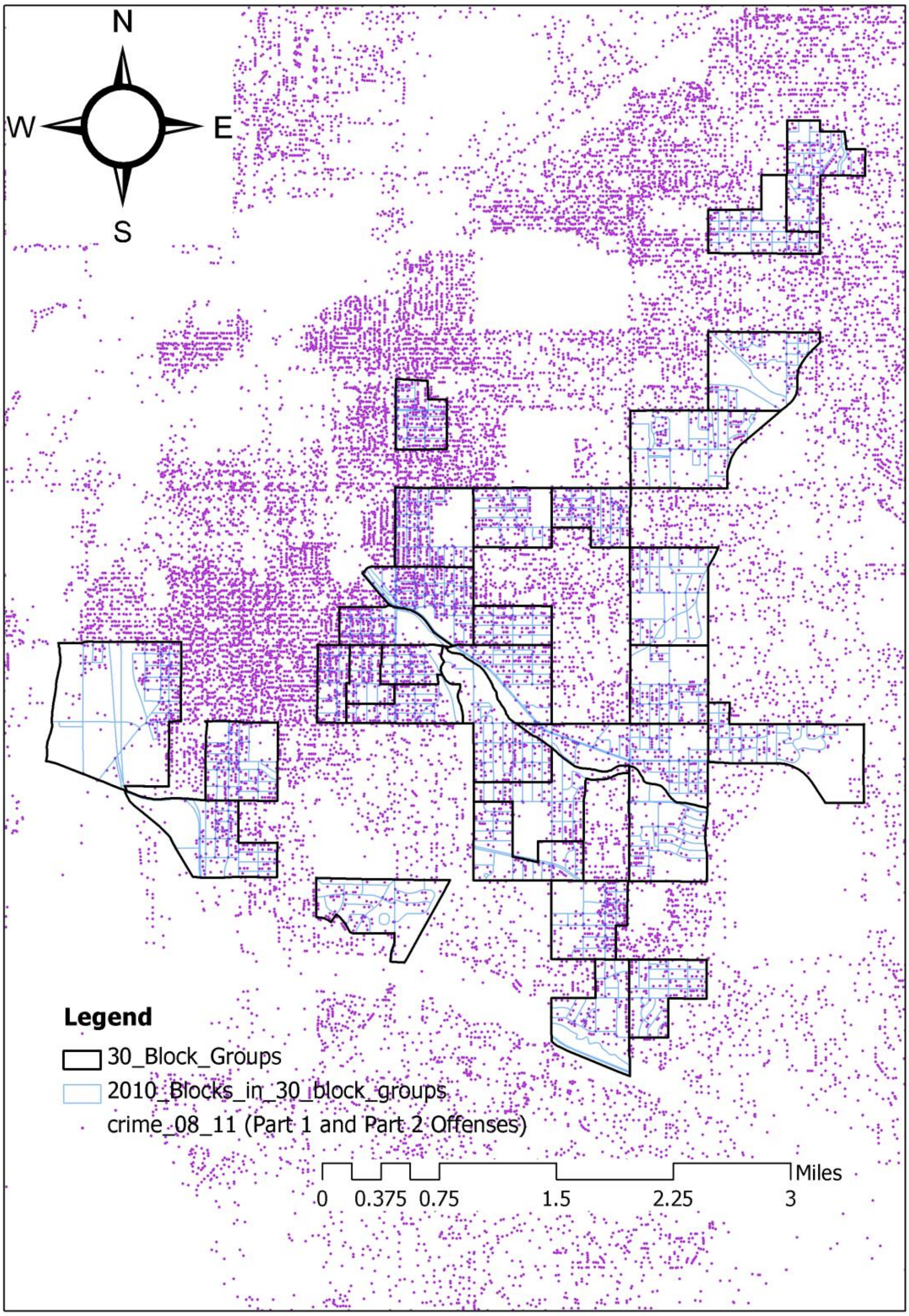


Figure 64. Distribution of Part 1 and Part 2 offenses in Lancaster County (NE)

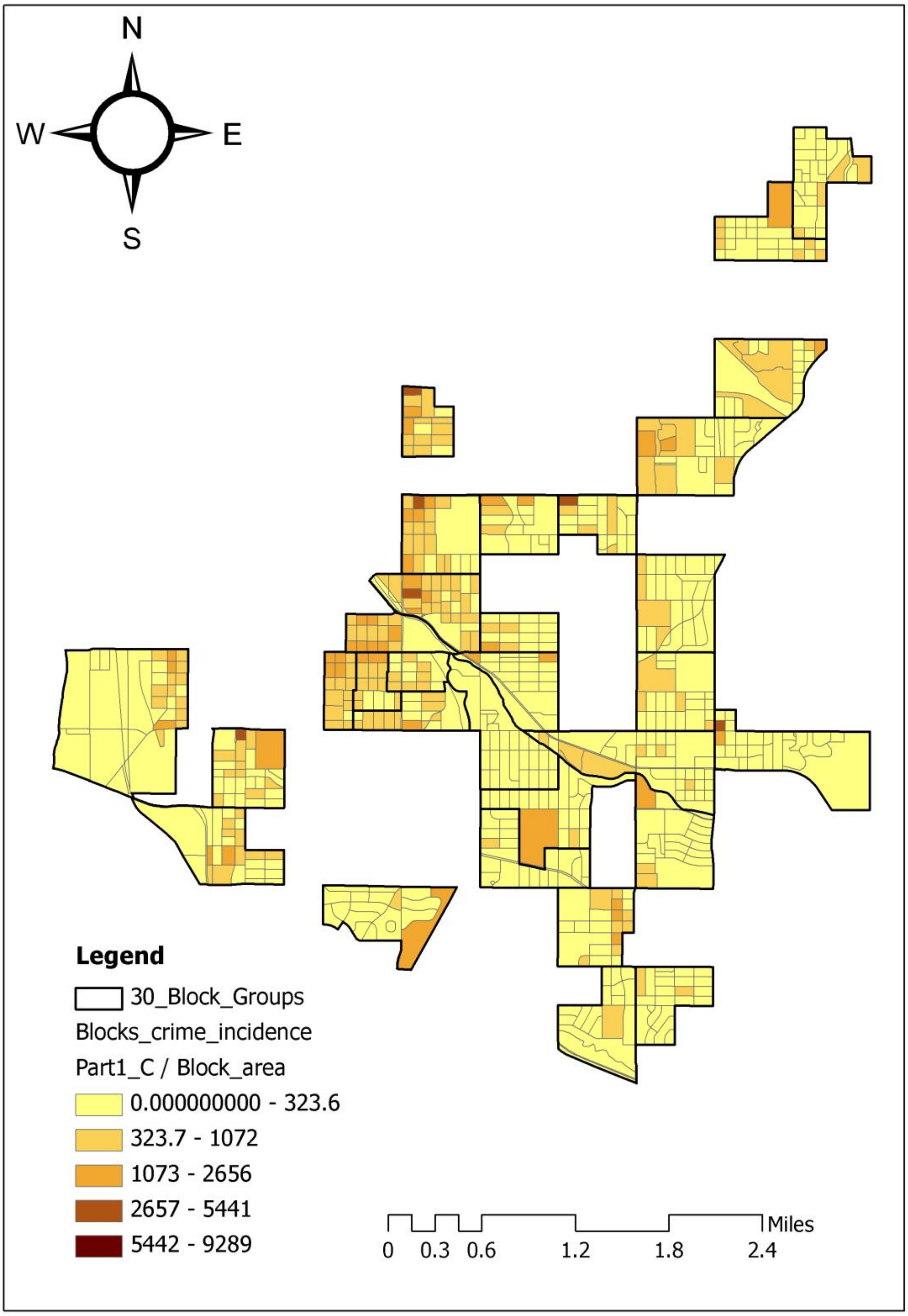


Figure 65. Distribution of blocks based on crime (Part 1 offenses) incidence
(the number of crime occurrence which is normalized by the population of a block)

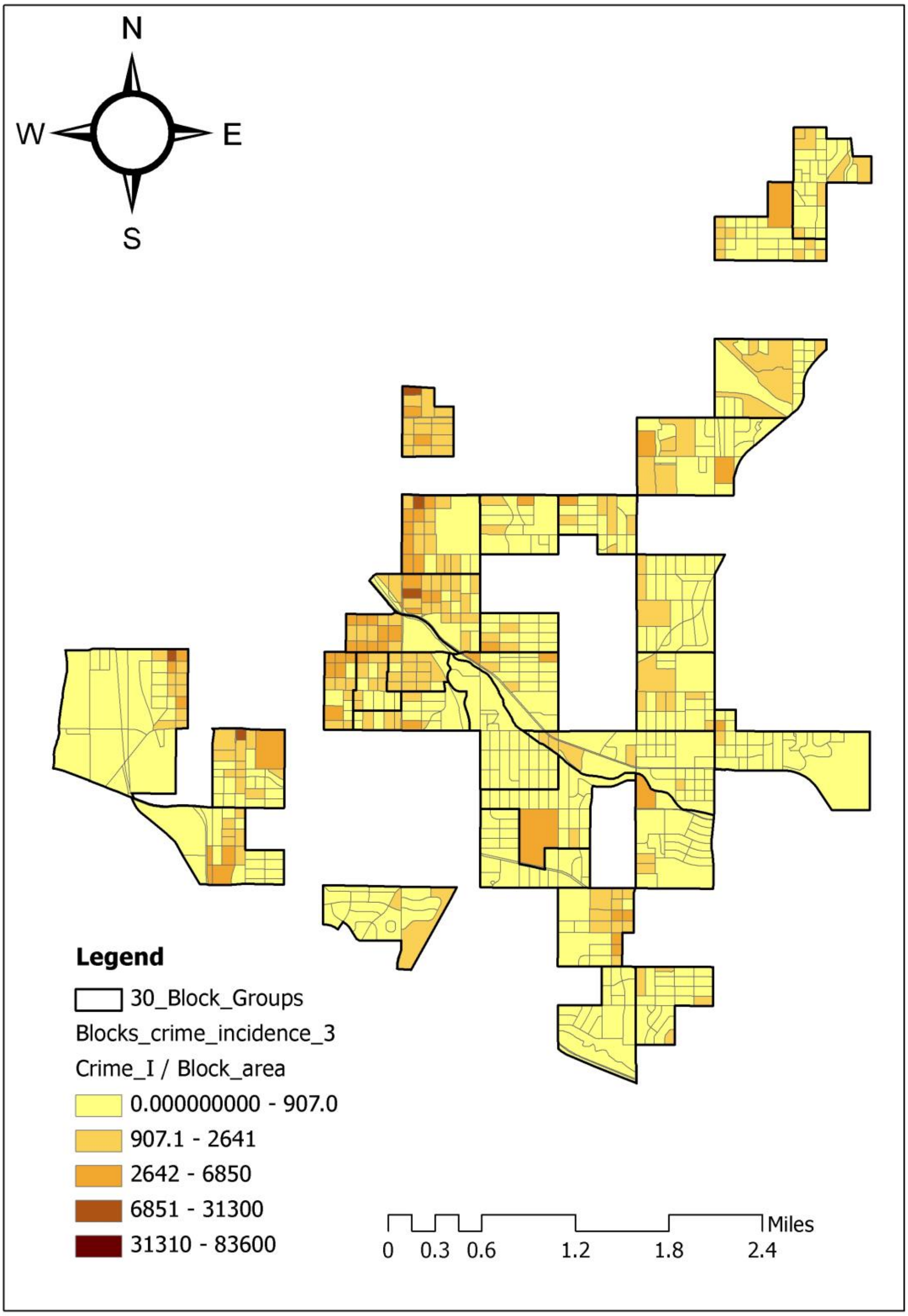


Figure 66. Distribution of blocks based on crimes (Part 1 & 2 offenses) incidence (the number of crime occurrence normalized by the population of a block)

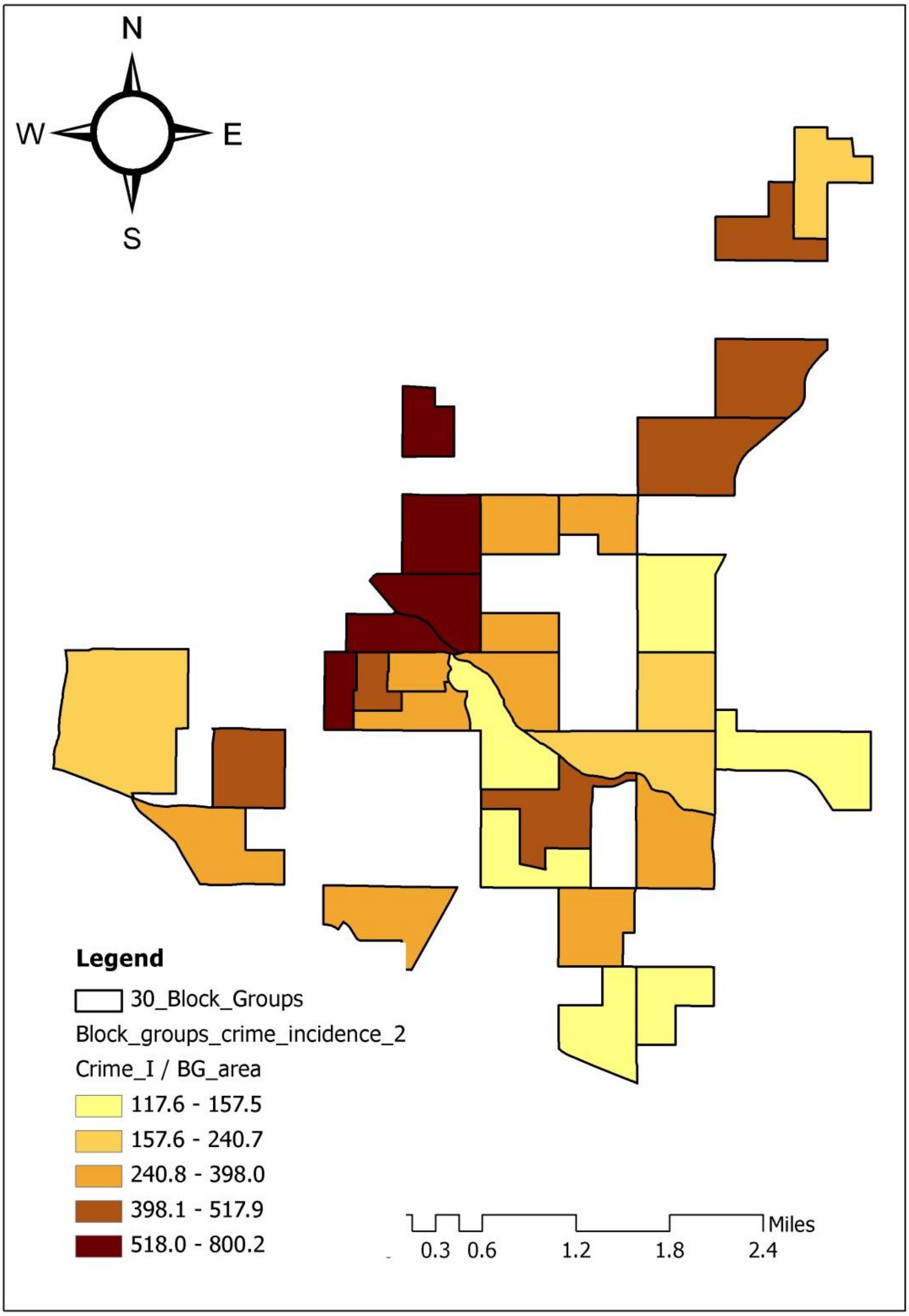


Figure 67. Distribution of block groups based on crime (Part 1 offenses) incidence (average number of crime occurrences normalized by the population of a BG)

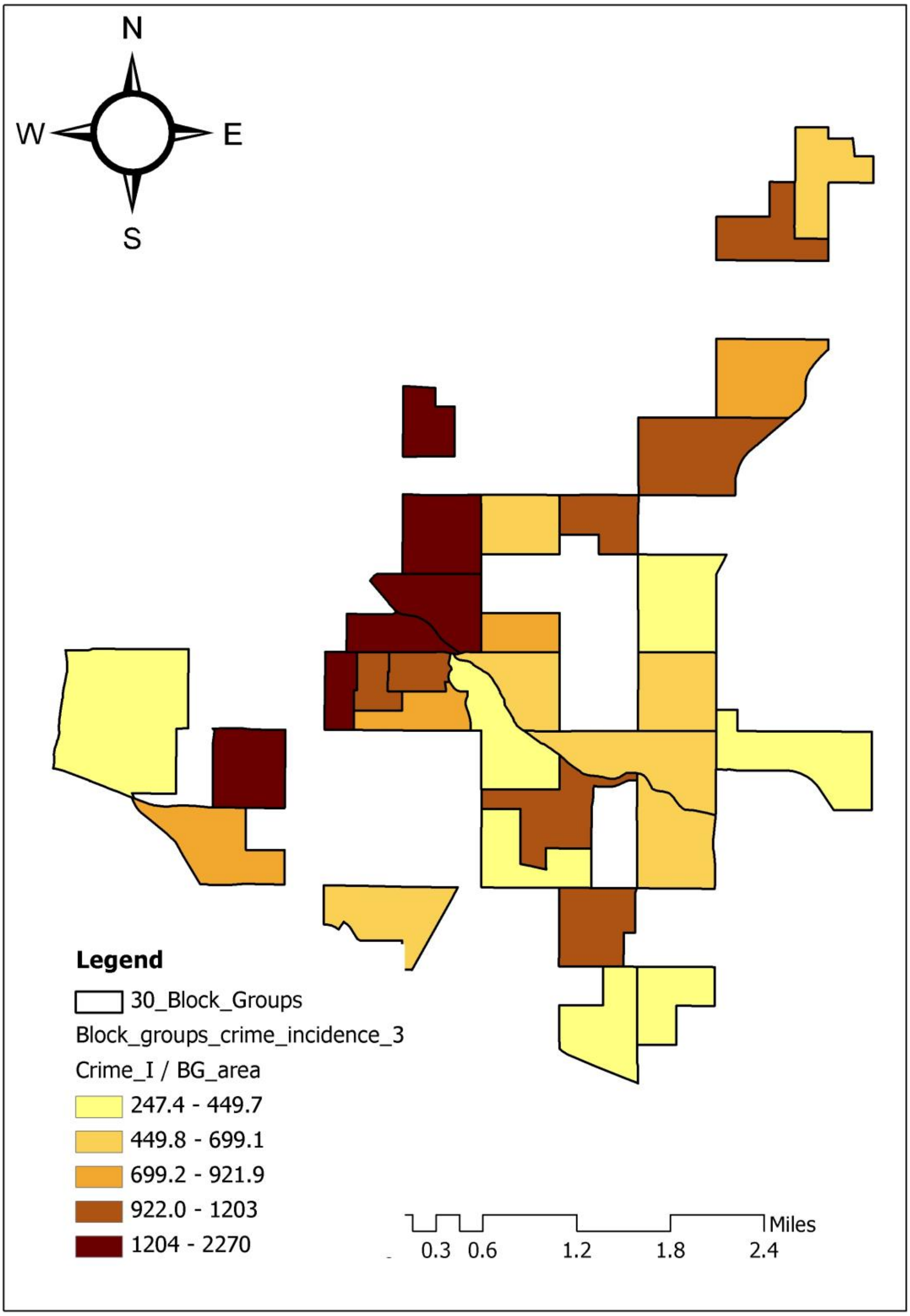


Figure 68. Distribution of BGs based on crimes (Part 1 & 2 offenses) incidence (average number of crime occurrences normalized by the population of a BG)

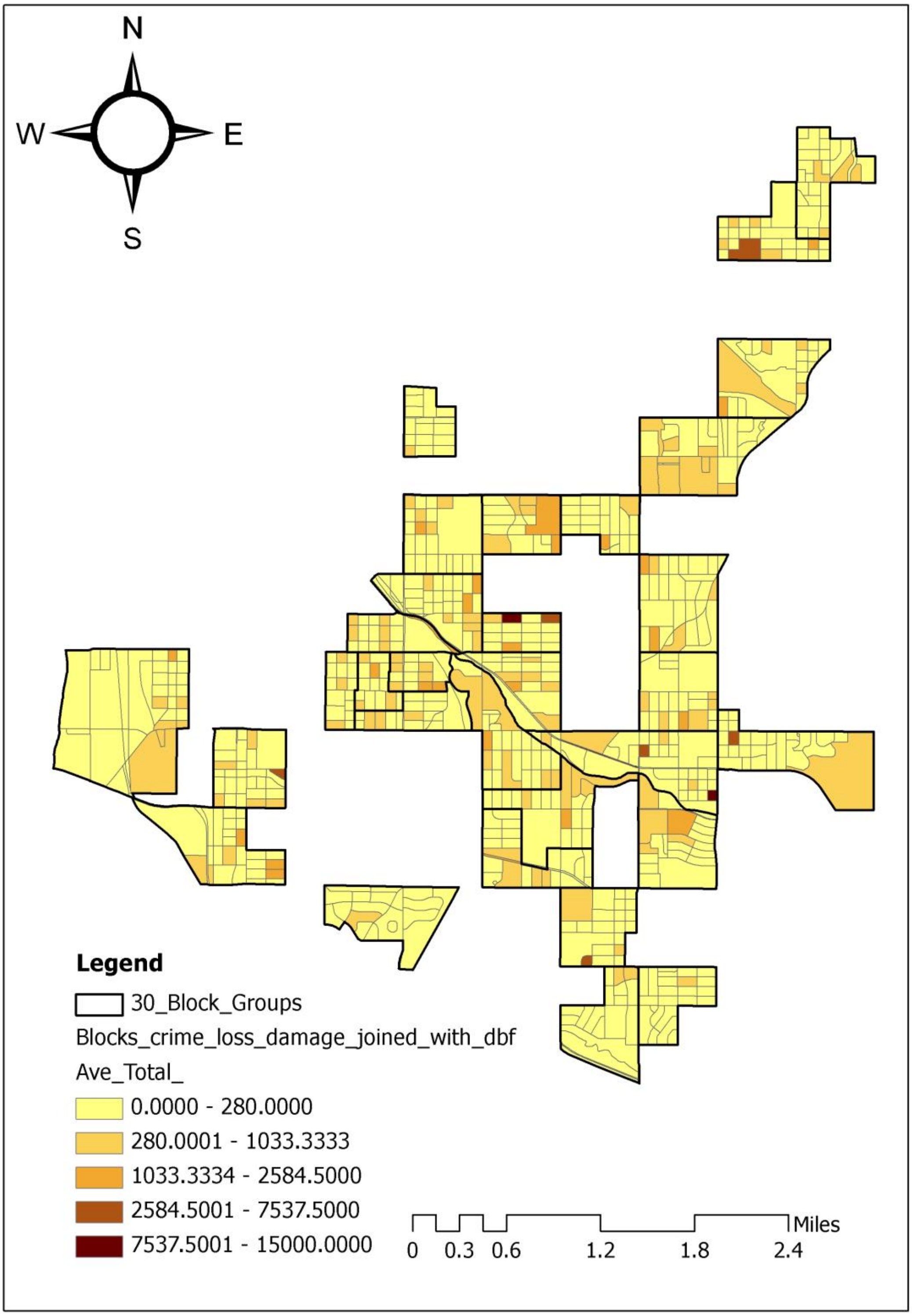


Figure 69. Distribution of blocks based on loss and damage caused by Part 1 offenses

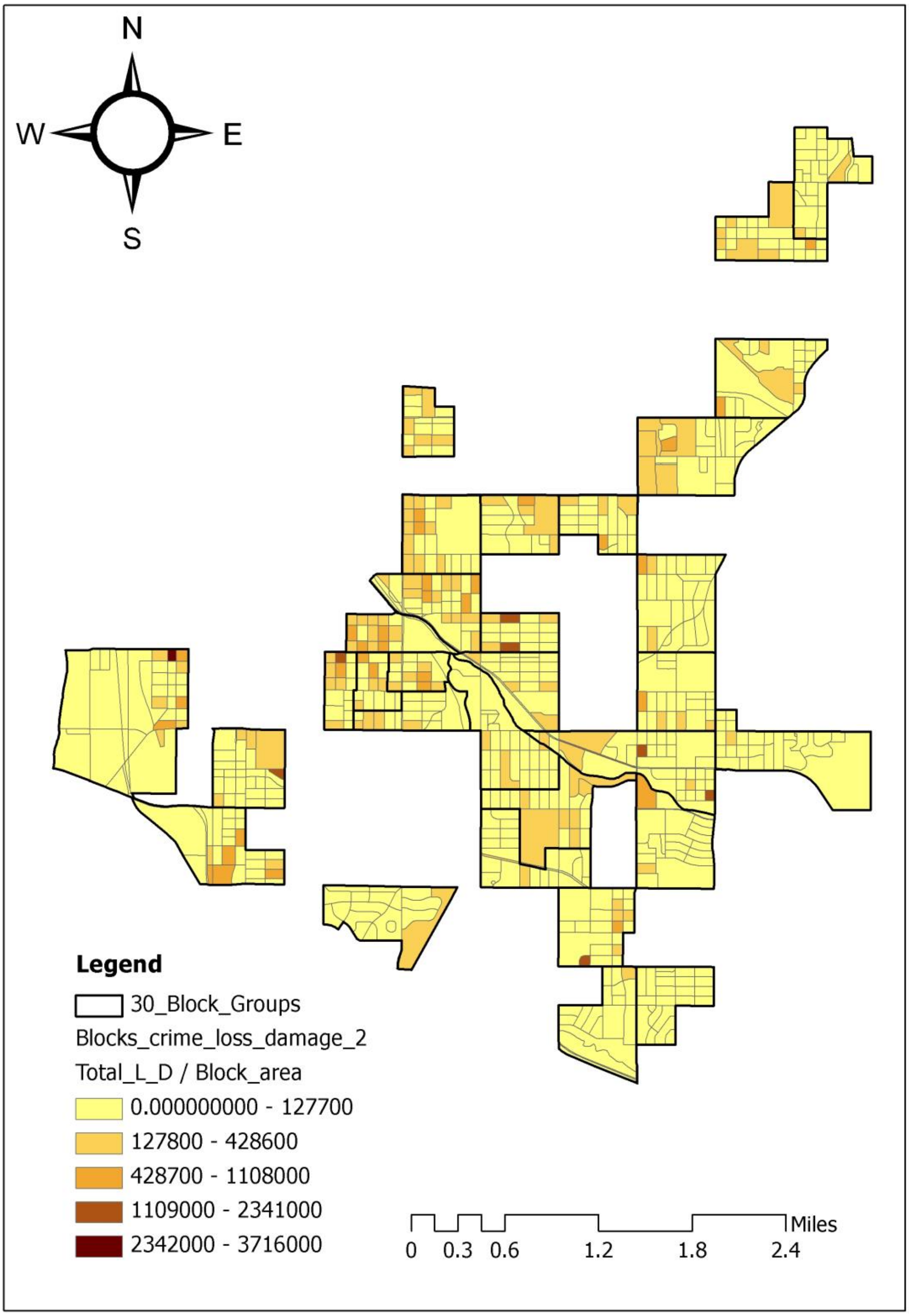


Figure 70. Distribution of blocks based on loss and damage
caused by Part 1 and Part 2 offenses

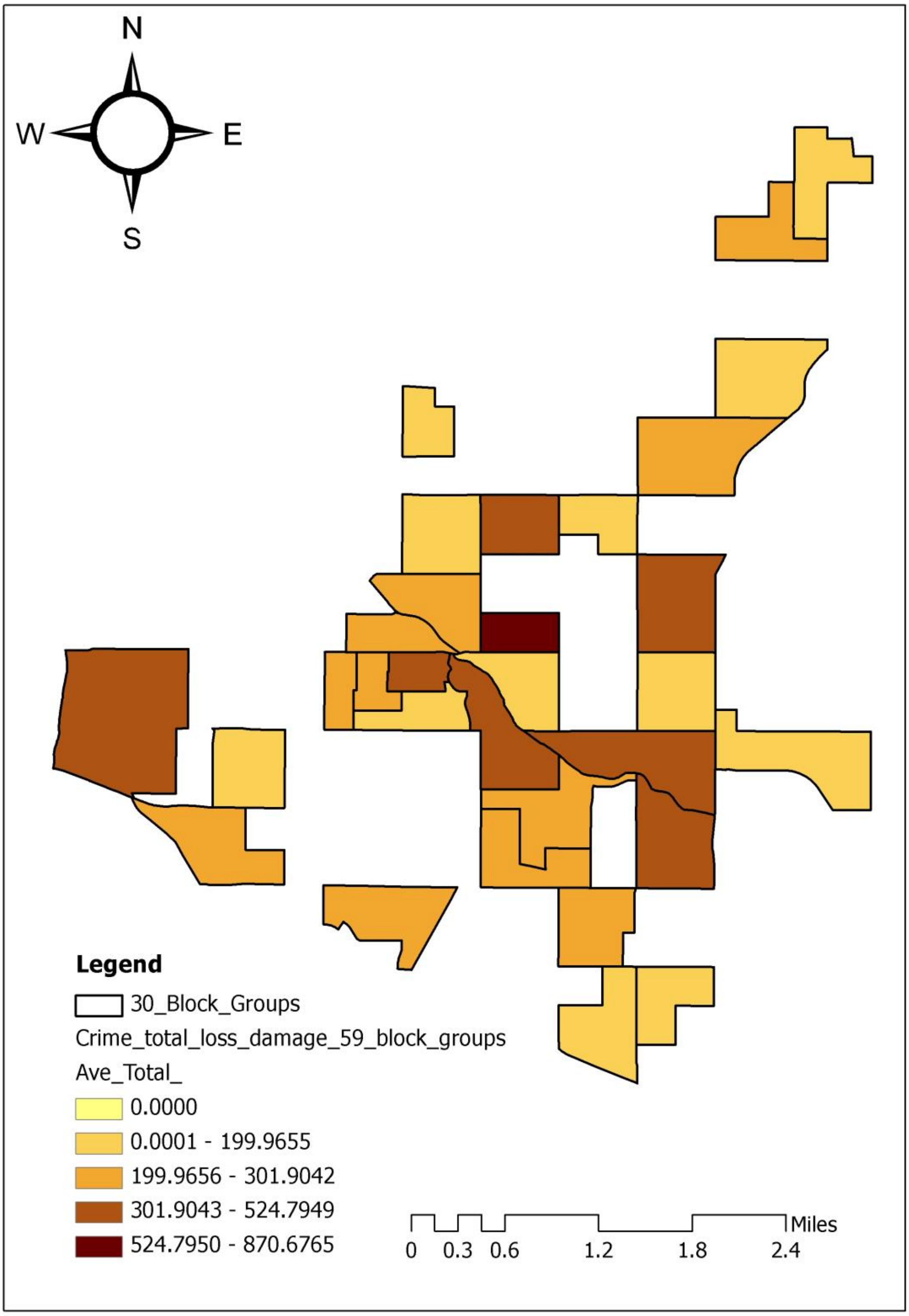


Figure 71. Distribution of block groups based on loss and damage caused by Part 1 offenses

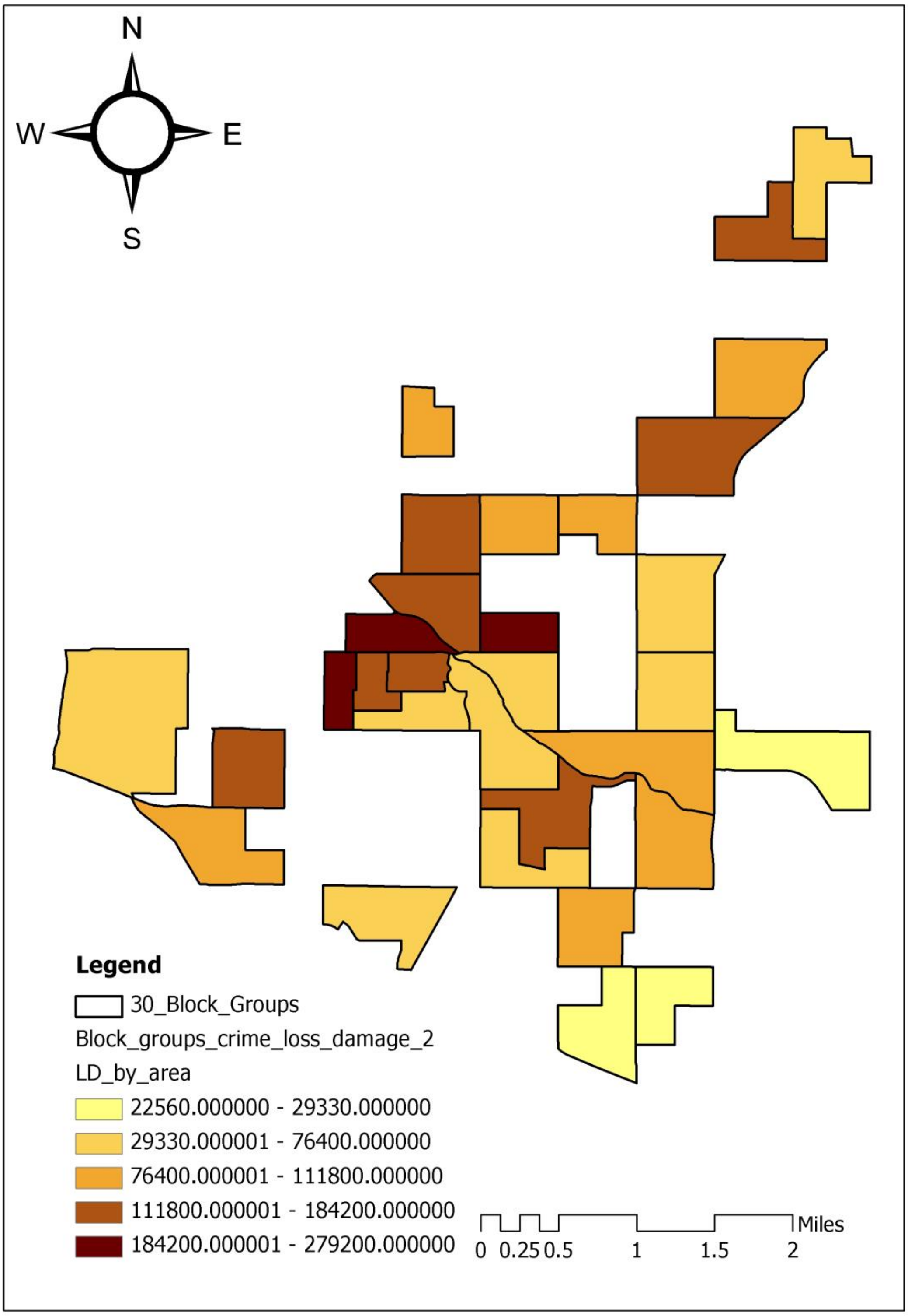


Figure 72. Distribution of block groups based on loss and damage caused by Part 1 and Part 2 offenses

CHAPTER 5: STATISTICAL ANALYSIS AND RESULT

Introduction

Once data for dependent and independent variables are collected, we conducted statistical analysis to examine the relationships between them and influential social capital variables regarding housing condition. As data collection is one of the important processes and a basic one, conducting a statistical analysis is very important because it lays out a logical basis for interpreting the relationships. SPSS is used to conduct statistical analysis in this dissertation research.

Statistical Analysis

As mentioned earlier, there are two main groups of independent variables. In the first group, there are variables related to neighborhood characteristics. In the second group, there are variables related to social capital.

In the group of neighborhood characteristics variables, a total seven variables are used as indexes to represent each neighborhood's condition in terms of socio-economic status. These include: educational attainment rate, median home value, median household income, median built year, below poverty level, unemployment rate, and household crowding level.

In the group of social capital variables, there are eleven variables used to measure the level of social capital for a community. These include: housing price inequality, homeownership rate, voter turnout, ethnic diversity, family status for marriage, family status for own children under 18 years old, social mobility (community attachment), and crime incidence N2, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD3. These variables will be explained later.

These selected neighborhood characteristics and social capital variables may not completely show the socio-economic status and the level of social capital of a community. However, since there is a limit to collecting data, only these available variables are used to measure overall socio-economic status and the level of social capital for a community.

The dependent variable is the condition of dwelling structure and environment. The dwelling condition is measured by the total composite score of a house. Measuring a total composite score of a house is a general assessment of a house, which means that each section's scores (scores from four sections of dwelling structure and environment: housing exterior, garage, yard / fence, and driveway / sidewalk) are combined to make the total composite score for the overall condition of a house. Thus, it is expected that overall condition for a house might be different from each section's interim composite scores.

In order to examine the relationship between the level of social capital and the condition of dwelling structure and environment, using classified dependent variables including total housing condition, structural housing condition, non-structural housing condition, housing exterior section condition, garage section condition, yard / fence section condition, and driveway / sidewalk section condition would help to understand the relationship in more detail.

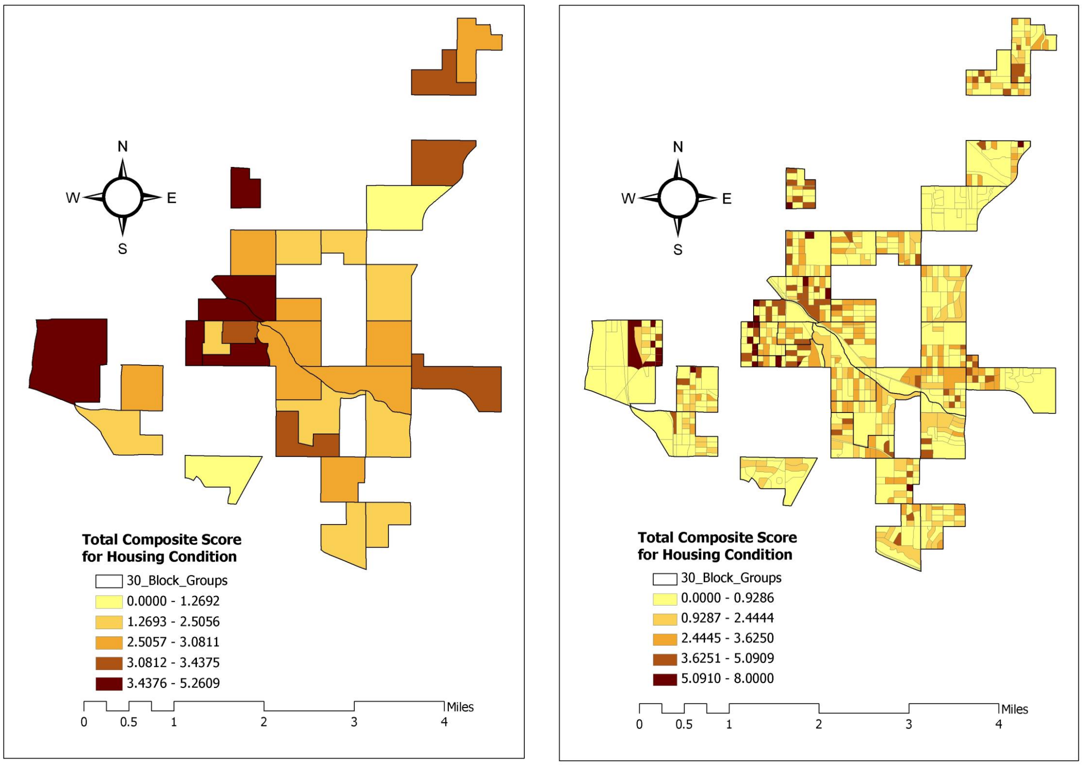
Identifying Social Capital's influence on the condition of dwelling structure and environment (Block Group Level Analysis)

With regard to the method of analysis, two different levels of analyses were conducted in this dissertation research: block group-level analysis and block-level analysis. First, for the purpose of identifying only the influence of social capital on the condition of dwelling structure and environment while controlling for the impact of neighborhood characteristics, block group-level analysis will be conducted because all three sets of variables (dependent variables, independent variables – neighborhood characteristics and social capital) have the same geographical unit for an analysis at the level of a Census block group. In the block group-level analysis, each set of independent variables' dimensions are reduced through components analysis due to the uncertainty of independent variables, small sample size, and to control for multicollinearity effect. Multiple regression analysis will help identify the impact of social capital on the condition of dwelling structure and environment.

Once social capital's impact on the condition of dwelling structure and environment is identified at an acceptable significance level (5% or 10%), block level analysis will be performed to examine which variable among the eleven variables of social capital is the most influential associated with the condition of dwelling structure and environment. For the block-level analysis, correlation analysis and multiple regression analysis are conducted at a block level. The figure (Figure 73) below shows the two different levels of analyses.

- Dependent Variable 1: Total Housing Condition

Among seven classified dependent variables (total housing condition, structural housing condition, non-structural housing condition, housing exterior condition, garage condition, yard/fence condition, driveway/sidewalk condition), total housing condition



Block group-level analysis Block-level analysis

Figure 73. Block group level analysis and block level analysis

is the first dependent variable used in block group-level analysis. Total housing condition is represented by the total composite score. Four interim composite scores from four sections (housing exterior, garage, yard-fence, and driveway-sidewalk) are combined to make a single total composite score. This total composite score represents the overall condition of dwelling structure and environment of a house.

There are two sets of independent variables: neighborhood characteristics and social capital. Based on the results of a statistical analysis, it can be identified whether there is a relationship between social capital and total housing condition represented by total composite score. The geographical unit for the analysis is a Census block group.

First, the normality of each variable (dependent and independent variables) was tested because normality is basic to proceeding with the next statistical analyses. Using data which are from normally distributed variables is a required condition for other statistical analyses, such as correlation analysis, to determine variables being used in components analysis. According to Table 25 below, some untransformed variables are not normally distributed: education attainment, median year of structure built, below poverty level, crowded households, unemployment rate, ethnic diversity, and crime rate. The non-normal variable values were transformed to log transformed data in SPSS, so that the not normally distributed variables are replaced with transformed variables. Table 26 is another normality test including transformed variables. After transformation, none of the variables are found to be significantly different from normal.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total Housing Condition	.144	30	.115	.946	30	.132
Education Attainment Rate	.179	30	.016	.904	30	.010
Median Home Value	.104	30	.200*	.974	30	.643
Median Year of Structure Built	.112	30	.200*	.934	30	.064
Median Householder Income	.102	30	.200*	.940	30	.089
Below Poverty Level	.180	30	.014	.885	30	.004
Household Crowding	.435	30	.000	.607	30	.000
Unemployment Rate	.155	30	.063	.929	30	.045
Social Mobility	.109	30	.200*	.965	30	.412
Marriage Rate	.108	30	.200*	.979	30	.807
Own Children Under 18 Years Old	.131	30	.200*	.954	30	.222
Ethnic Diversity	.197	30	.004	.828	30	.000
Homeownership Rate	.141	30	.132	.952	30	.194
Voter Turnout	.145	30	.110	.938	30	.078
Housing Price Inequality	.129	30	.200*	.946	30	.133
Crime Incidence N2	.127	30	.200*	.936	30	.069
Crime Incidence N3	.182	30	.012	.902	30	.009
Crime Loss and Damage LD1	.145	30	.109	.913	30	.017
Crime Loss and Damage LD2	.168	30	.030	.917	30	.022

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Table 25. Normality tests

Crime rate is classified into four types. ‘Crime_N2’ represents the incidence of crime (Part 1 offenses) normalized by total population of a block group. ‘Crime_N3’ represents the incidence of crime (all kinds of offenses) normalized by total population of a block group. ‘Crime_ND1’ represents total loss and damage of crime (Part 1 offenses) normalized by total population of a block group. ‘Crime_ND2’ represents total loss and damage of crime (all kinds of offenses) normalized by total population of a block group.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Total Housing Condition	.223	6	.200*	.898	6	.361
LN Education Attainment Rate	.257	6	.200*	.867	6	.216
Median Home Value	.131	6	.200*	.978	6	.941
Median Year of Structure Built	.269	6	.200*	.846	6	.145
Median Householder Income	.147	6	.200*	.985	6	.974
LN Below Poverty Level	.289	6	.129	.876	6	.253
LN Household Crowding	.230	6	.200*	.959	6	.811
LN Unemployment Rate	.268	6	.200*	.874	6	.244
Social Mobility	.305	6	.084	.883	6	.283
Marriage Rate	.152	6	.200*	.988	6	.983
Own Children Under 18 Years Old	.270	6	.195	.803	6	.063
LN Ethnic Diversity	.224	6	.200*	.935	6	.621
Homeownership Rate	.177	6	.200*	.980	6	.953
Voter Turnout	.177	6	.200*	.941	6	.671
Housing Price Inequality	.187	6	.200*	.943	6	.680
Crime Incidence N2	.197	6	.200*	.953	6	.767
LN Crime Incidence N3	.223	6	.200*	.936	6	.628
LN Crime Loss and Damage LD1	.225	6	.200*	.859	6	.184
LN Crime Loss and Damage LD2	.224	6	.200*	.872	6	.236

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 26. Normality tests for transformed variables

The next step is to identify which variables should be used for components analysis. Before conducting components analysis, it is necessary to satisfy two conditions. Correlation coefficients between potential independent variables and the dependent variable should be over 0.3 which is the minimum level. Also, among correlation coefficients of an independent variable with the other independent variables, at least one coefficient should be 0.3. Otherwise the independent variables could not be grouped to extract components from components analysis. In other words, the variables not related to other variables are not supposed to be used in components analysis because it is difficult to obtain stable components from the variables. And we need to examine the appropriateness of components analysis through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity on the reduced correlation matrices.

Correlation analyses are conducted respectively in each group of variables (neighborhood characteristics group and social capital group). According to the results of the first correlation analysis (Table 27) including the dependent variable and neighborhood characteristics variables, six variables are relevant and valid to be used in components analysis: education attainment rate, median home value, median year of structure built, median householder income, below poverty level, and unemployment rate. Likewise, in the second correlation analysis including the dependent variable and social capital variables, we identified seven variables which are relevant and valid to be used in components analysis: social mobility, ethnic diversity, homeownership rate, voter turnout, housing price inequality, crime incidence N2, and crime incidence N3.

Table 27. The result of the correlation analysis between the dependent variable (total housing condition) and neighborhood characteristics variables

		Total Housing Condition	LN Education Attainment Rate	Median Home Value	Median Year of Structure Built	Median Householder Income	LN Below Poverty Level	LN Household Crowding	LN Unemployment Rate
Total Housing Condition	Pearson Correlation	1	-.406*	-.478**	-.368*	-.390*	.575**	-.256	.392
	Sig. (2-tailed)		.026	.007	.046	.033	.001	.541	.052
	N	30	30	30	30	30	29	8	25
LN Education Attainment Rate	Pearson Correlation	-.406*	1	.566**	.072	.484**	-.328	.258	-.211
	Sig. (2-tailed)	.026		.001	.704	.007	.083	.537	.312
	N	30	30	30	30	30	29	8	25
Median Home Value	Pearson Correlation	-.478**	.566**	1	.509**	.448*	-.507**	-.409	-.202
	Sig. (2-tailed)	.007	.001		.004	.013	.005	.314	.334
	N	30	30	30	30	30	29	8	25
Median Year of Structure Built	Pearson Correlation	-.368*	.072	.509**	1	.186	-.508**	-.678	-.250
	Sig. (2-tailed)	.046	.704	.004		.325	.005	.065	.229
	N	30	30	30	30	30	29	8	25
Median Householder Income	Pearson Correlation	-.390*	.484**	.448*	.186	1	-.623**	.292	-.263
	Sig. (2-tailed)	.033	.007	.013	.325		.000	.483	.204
	N	30	30	30	30	30	29	8	25
LN Below Poverty Level	Pearson Correlation	.575**	-.328	-.507**	-.508**	-.623**	1	-.137	.414*
	Sig. (2-tailed)	.001	.083	.005	.005	.000		.746	.040
	N	29	29	29	29	29	29	8	25
LN Household Crowding	Pearson Correlation	-.256	.258	-.409	-.678	.292	-.137	1	.018
	Sig. (2-tailed)	.541	.537	.314	.065	.483	.746		.966
	N	8	8	8	8	8	8	8	8
LN Unemployment Rate	Pearson Correlation	.392	-.211	-.202	-.250	-.263	.414*	.018	1
	Sig. (2-tailed)	.052	.312	.334	.229	.204	.040	.966	
	N	25	25	25	25	25	25	8	25

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 28. The result of the correlation analysis between the dependent variable (total housing condition) and social capital variables

		Total housing condition	Social Mobility	Marriage Rate	Own Children 18	LN Ethnic Diversity	Homeownership Rate	Voter Turnout	Housing Price Inequality	Crime Incidence N2	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
Total housing condition	Pearson Correlation	1	-.570**	-.229	.291	.519**	-.420*	-.514**	.571**	.357	.425*	.247	.281
	Sig. (2-tailed)		.001	.224	.119	.003	.021	.004	.001	.053	.019	.188	.132
	N	30	30	30	30	30	30	30	30	30	30	30	30
Social Mobility	Pearson Correlation	-.570**	1	.430*	-.157	-.597**	.442*	.506**	-.594**	-.282	-.427*	-.289	-.328
	Sig. (2-tailed)	.001		.018	.407	.000	.015	.004	.001	.131	.019	.122	.076
	N	30	30	30	30	30	30	30	30	30	30	30	30
Marriage Rate	Pearson Correlation	-.229	.430*	1	.588**	-.196	.678**	.529**	-.073	.025	-.112	-.213	-.219
	Sig. (2-tailed)	.224	.018		.001	.300	.000	.003	.701	.895	.554	.259	.246
	N	30	30	30	30	30	30	30	30	30	30	30	30
Own Children 18	Pearson Correlation	.291	-.157	.588**	1	.350	.157	.014	.226	.206	.272	-.049	.005
	Sig. (2-tailed)	.119	.407	.001		.058	.406	.941	.230	.276	.146	.797	.978
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Ethnic Diversity	Pearson Correlation	.519**	-.597**	-.196	.350	1	-.669**	-.735**	.448*	.480**	.580**	.242	.308
	Sig. (2-tailed)	.003	.000	.300	.058		.000	.000	.013	.007	.001	.197	.097
	N	30	30	30	30	30	30	30	30	30	30	30	30
Homeownership Rate	Pearson Correlation	-.420*	.442*	.678**	.157	-.669**	1	.850**	-.251	-.233	-.368*	-.201	-.241
	Sig. (2-tailed)	.021	.015	.000	.406	.000		.000	.180	.215	.046	.287	.200
	N	30	30	30	30	30	30	30	30	30	30	30	30
Voter Turnout	Pearson Correlation	-.514**	.506**	.529**	.014	-.735**	.850**	1	-.302	-.313	-.460*	-.202	-.234
	Sig. (2-tailed)	.004	.004	.003	.941	.000	.000		.105	.092	.011	.285	.213
	N	30	30	30	30	30	30	30	30	30	30	30	30
Housing Price Inequality	Pearson Correlation	.571**	-.594**	-.073	.226	.448*	-.251	-.302	1	.410*	.410*	.346	.383*
	Sig. (2-tailed)	.001	.001	.701	.230	.013	.180	.105		.024	.025	.061	.036
	N	30	30	30	30	30	30	30	30	30	30	30	30
Crime Incidence N2	Pearson Correlation	.357	-.282	.025	.206	.480**	-.233	-.313	.410*	1	.930**	.681**	.743**
	Sig. (2-tailed)	.053	.131	.895	.276	.007	.215	.092	.024		.000	.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Incidence N3	Pearson Correlation	.425*	-.427*	-.112	.272	.580**	-.368*	-.460*	.410*	.930**	1	.666**	.745**
	Sig. (2-tailed)	.019	.019	.554	.146	.001	.046	.011	.025	.000		.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD1	Pearson Correlation	.247	-.289	-.213	-.049	.242	-.201	-.202	.346	.681**	.666**	1	.984**
	Sig. (2-tailed)	.188	.122	.259	.797	.197	.287	.285	.061	.000	.000		.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD2	Pearson Correlation	.281	-.328	-.219	.005	.308	-.241	-.234	.383*	.743**	.745**	.984**	1
	Sig. (2-tailed)	.132	.076	.246	.978	.097	.200	.213	.036	.000	.000	.000	
	N	30	30	30	30	30	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

The results of the two correlation analyses show that six and seven variables in each group (i.e., neighborhood characteristics group and social capital group) are valid to be used in components analysis to obtain components for a multiple regression analysis. A component (i.e., latent factor) cannot be measured directly but is measured indirectly through manifest variables which are observable variables (Robin Beaumont, 2012). There are two common methods in extracting the factors: Principal components and Principal axis factoring extraction methods. However, the Principal components method often gives similar results compared to the other method.

After we examine the appropriateness of components analysis through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity, we can conduct components analysis. In each components analysis, we select the Varimax as the rotation method in SPSS for the components. Then we obtained rotated component scores (standardized scores for the components) from the rotated components which are added to the data set automatically for multiple regression analysis. Once rotated component scores are obtained from components analysis for each group, they will be used in a multiple regression model to identify the impact of social capital on dwelling structure and environment while controlling for neighborhood characteristics.

Within each block group-level analysis, multiple regression analysis was conducted using the rotated component scores obtained from each components analysis (social capital group and neighborhood characteristics group) as independent variables. Figure 74 below shows the general multiple regression model employed.

$$\boldsymbol{Y = a + b_1 \cdot x_1 + b_2 \cdot x_2 + b_3 \cdot x_3 + b_4 \cdot x_4}$$

$\boldsymbol{Y}$: Total housing condition

$\boldsymbol{x_1} \sim \boldsymbol{x_2}$: Components from neighborhood characteristics variables

$\boldsymbol{x_3} \sim \boldsymbol{x_4}$: Components from social capital variables

$\boldsymbol{a}$: y-intercept

$\boldsymbol{b_1} \sim \boldsymbol{b_4}$: Regression coefficients

Figure 74. Multiple regression model

One of the main objectives of this dissertation research is to identify the impact of social capital on the condition of dwelling structure and environment. Neighborhood characteristics representing the socio-economic status of a community are also somewhat associated with the condition of dwelling structure and environment because housing condition is mainly determined by social and economic issues. However, in this dissertation research it is desired to examine if the level of social capital has a statistically significant impact on the condition of dwelling structure and environment when compared to and controlling for the impact of neighborhood characteristics on the housing condition.

Thus, a multiple regression analysis was conducted. Multiple regression analysis helps find different contributions of each component from the multiple regression function. Importantly, variables exhibiting multicollinearity are not appropriate to be used together in multiple regression analysis because the variables could influence the measured contribution of social capital measures on dwelling structure and environment erratically. If some independent variables are closely related to each other, then they could have indeterminant influence on housing condition. However, components which are represented by rotated component scores are orthogonal and thus avoid effects of multicollinearity. The effects of multicollinearity are removed from the components represented by rotated component scores.

Table 29 below shows the results of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity in the group of the social capital variables for components analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is an index used to examine the appropriateness of components analysis. The KMO ranges from 0 to 1.0. The generally acceptable index value for KMO in academic research is over 0.5 in order to proceed with components analysis. Bartlett's test of sphericity is a test used to examine the hypothesis that the correlation matrix is an identity matrix. In other words, no variable has correlation with the other variables. If the significance value for a test is less than 0.05, we reject the null hypothesis. This means that some of the variables in the data set are correlated with each other, so it would be possible to conduct components analysis.

In the group of social capital variables, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is .716, which meets the minimum criteria (0.5). And, the significance value for the Bartlett's Test of Sphericity is less than .05, so that we reject the null hypothesis that all variables in the data set are uncorrelated with each other. Thus, conducting components analysis is appropriate in the group of social capital variables.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.716
Bartlett's Test of Sphericity	Approx. Chi-Square	149.457
	df	21
	Sig.	.000

Table 29. KMO and Bartlett's test in the components analysis for social capital variables in the first block group-level analysis

There are seven block group-level analyses based on classified dependent variables: total housing condition, structural housing condition, non-structural housing condition, housing exterior condition, garage condition, yard/fence condition, driveway/sidewalk condition. In the first block group-level analysis (dependent variable: total housing condition), two components are obtained from the group of social capital variables. The following tables (Table 30 and Table 31) show the results of the components analysis.

COMPONENT	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	3.973	56.762	56.762	3.973	56.762	56.762	2.822	40.307	40.307
2	1.286	18.375	75.137	1.286	18.375	75.137	2.438	34.829	75.137
3	.915	13.070	88.207						
4	.370	5.288	93.495						
5	.267	3.818	97.313						
6	.141	2.014	99.327						
7	.047	.673	100.000						

Extraction Method: Principal Component Analysis.

Table 30. Proportion of variance summarized in the components analysis for social capital variables in the first block group-level analysis

Table 30 shows the two components extracted from the components analysis along with their Eigenvalues, the percent of variance attributable to each component, and the cumulative variance of the two components. The first rotated component accounts for 40.307% of the variance, and the second rotated component accounts for 34.829%.

Table 31 below shows the loadings of the seven social capital variables on the two components extracted. If the absolute value of the loading of a variable is higher, the variable contributes to the components more substantially. The variables with loadings that are less than 0.5 are regarded as lesser contributing variables. It can be seen that homeownership rate, voter turnout, ethnic diversity, and social mobility are substantially loaded on Component 1.

	Component	
	1	2
Homeownership Rate	.911	-.078
Voter Turnout	.910	-.184
LN Ethnic Diversity	-.770	.442
Social Mobility	.623	-.389
Crime Incidence N2	-.088	.946
LN Crime Incidence N3	-.261	.907
Housing Price Inequality	-.326	.578

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 31. Varimax Rotated Component Matrix for social capital variables in the first block group-level analysis

On the other hand, crime incidence N2 (Part 1 offenses), crime incidence N3 (all types of offenses), and housing price inequality are substantially loaded on Component 2. These two components represented by rotated component scores will be used as variables for multiple regression analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.612
Bartlett's Test of Sphericity	Approx. Chi-Square	46.197
	df	15
	Sig.	.000

Table 32. KMO and Bartlett's test in the components analysis for neighborhood characteristics variables in the first block group-level analysis

According to Table 32, the results of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity for the second components analysis dealing with neighborhood characteristics variables, the value of KMO measure of sampling adequacy is 0.612 (which is over 0.5) and the significance value for the Bartlett's test of sphericity in the data set of neighborhood characteristics variables is less than 0.05 (which means some of the variables are correlated with each other in the data set). This means that it is appropriate to conduct components analysis to extract components. Thus, in the first block group-level analysis (dependent variable: total housing condition), the second components analysis is undertaken to extract components from neighborhood characteristics variables.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.823	47.053	47.053	2.823	47.053	47.053	2.020	33.661	33.661
2	1.129	18.822	65.875	1.129	18.822	65.875	1.933	32.214	65.875
3	.869	14.484	80.359						
4	.693	11.558	91.916						
5	.254	4.228	96.144						
6	.231	3.856	100.000						

Extraction Method: Principal Component Analysis.

Table 33. Proportion of variance summarized in the components analysis for neighborhood characteristics variables in the first block group-level analysis

Table 33 shows the two components extracted from the components analysis. The first rotated component accounts for 33.661% of total variance, and the second rotated component accounts for 32.214% of total variance.

	Component	
	1	2
Median Year of Structure Built	.870	-.117
LN Below Poverty Level	-.727	-.399
LN Unemployment Rate	-.531	-.205
LN Education Attainment Rate	-.076	.902
Median Householder Income	.404	.740
Median Home Value	.532	.597

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 34. Varimax Rotated Component Matrix for neighborhood characteristics variables in the first block group-level analysis

Table 34 shows the loadings of the six neighborhood characteristics variables on the two components extracted. Median built year, below poverty level, unemployment rate, and median home value are substantially loaded on Component 1. On the other hand, educational attainment rate, median householder income, and median home value are substantially loaded on Component 2. These two components represented by rotated component scores will be used as variables for multiple regression analysis.

In a multiple regression analysis, the R^2 is the percent of variability in the dependent variable that can be accounted for by all the predictors which are components included together. Unstandardized Coefficients (B) are used as regression coefficients to make a regression equation for accurate prediction. However, each independent variable generally has different units of measurement. Thus, Standardized Coefficients (Beta) are more useful when used to compare the influences caused by each component summarizing neighborhood characteristics variables and social capital variables on housing condition.

Dependent variable: total housing condition

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value
(Constant)	3.244		.000
Neighborhood_characteristics_Component1	-.221	-.270	.301
Neighborhood_characteristics_Component2	-.144	-.176	.441
Social_capital_Component1	-.208	-.252	.297
Social_capital_Component2	.181	.215	.368

R^2 = 0.404, adjusted R^2 = 0.285, F-ratio = 3.393, n = 30.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 35. The results of the multiple regression analysis in the first block group-level analysis

However, rotated component scores representing components used in the multiple regression analysis are standardized values, so that there are small differences between Unstandardized Coefficients (B) and Standardized Coefficients (Beta). In fact, Standardized Coefficients (Beta) use the standardized scores for both dependent and independent variables.

Standardized regression coefficients helps to show how much a dependent variable is expected to increase or decrease in Z-score in standard deviation units when an independent variable increases by one standard deviation unit while controlling for all the other variables. According to Table 35, none of the social capital components have an impact on total housing condition at an acceptable significance level (Ho: b=0) when compared to the impact of other components from neighborhood characteristics on the total housing condition.

- Dependent Variable 2: Structural Housing Condition

The second dependent variable is structural housing condition. Two sections are involved in the structural housing condition: housing exterior section and garage section. In order to obtain the value of structural housing condition as a dependent variable, two interim composite scores from each section are combined to make a single composite score for structural housing condition.

First, the normality of the dependent variable (i.e., structural housing condition) was conducted. Table 36 below shows that the dependent variable is normally distributed.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Structural Housing Condition	.250	8	.150	.872	8	.156

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 36. Normality test of the dependent variable (structural housing condition)

In the second block group-level analysis, the next step is to identify which variables will be used in components analysis. As mentioned earlier, one of the conditions for conducting components analysis is that variables being used in the components analysis should be correlated to the dependent variable. If one variable which is not related to other variables is used in components analysis, the variable does not contribute to finding a common component, though it could form its own unique component. Correlation analysis helps to find appropriate variables to be used in the components analysis.

In the same manner as with the first block group-level analysis (dependent variable: total housing condition), correlation analyses are conducted respectively in each group of variables (neighborhood characteristics group and social capital group). The results of the first correlation analysis (Table 38) including the dependent variable (i.e., structural housing condition) and neighborhood characteristics variables shows that five variables are valid to be used in components analysis: median home value, median year of structure built, median householder income, below poverty level, and unemployment rate. In the second correlation analysis including the dependent variable (i.e., structural housing condition) and social capital variables, ten variables (social mobility, own children under 18 years, ethnic diversity, homeownership rate, voter turnout, housing price inequality, crime incidence N2, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD2) are identified as valid variables to be used in components analysis.

In the second block group-level analysis, according to Table 38 and Table 39, ten and five variables in each group (i.e., social capital group and neighborhood characteristics group) will be used in separate components analyses to obtain components. However, before conducting components analysis, it is needed to examine the appropriateness of components analysis through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity on the reduced correlation matrices.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.658
Bartlett's Test of Sphericity	Approx. Chi-Square	286.962
	df	45
	Sig.	.000

Table 37. KMO and Bartlett's test in the components analysis for social capital variables in the second block group-level analysis

According to Table 37, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.658, and the significance value for the Bartlett's Test of Sphericity is less than 0.05. It shows that it is appropriate to conduct components analysis in the group of social capital variables.

In the group of social capital variables, there are three components extracted from the group.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.832	48.323	48.323	4.832	48.323	48.323	3.427	34.273	34.273
2	1.909	19.088	67.411	1.909	19.088	67.411	3.068	30.680	64.953
3	1.311	13.108	80.519	1.311	13.108	80.519	1.557	15.566	80.519
4	.855	8.546	89.065						
5	.403	4.035	93.100						
6	.335	3.345	96.445						
7	.177	1.774	98.219						
8	.131	1.308	99.527						
9	.040	.399	99.926						
10	.007	.074	100.000						

Extraction Method: Principal Component Analysis.

Table 38. Proportion of variance summarized in the components analysis for social capital variables in the second block group-level analysis

Table 39. The result of the correlation analysis between the dependent variable (structural housing condition) and neighborhood characteristics variables

		Structural Housing Condition	LN Education Attainment Rate	Median Home Value	Median Year of Structure Built	Median Householder Income	LN Below Poverty Level	LN Household Crowding	LN Unemployment Rate
Structural Housing Condition	Pearson Correlation	1	-.270	-.571**	-.605**	-.492**	.778**	.200	.508**
	Sig. (2-tailed)		.148	.001	.000	.006	.000	.635	.010
	N	30	30	30	30	30	29	8	25
LN Education Attainment Rate	Pearson Correlation	-.270	1	.566**	.072	.484**	-.328	.258	-.211
	Sig. (2-tailed)	.148		.001	.704	.007	.083	.537	.312
	N	30	30	30	30	30	29	8	25
Median Home Value	Pearson Correlation	-.571**	.566**	1	.509**	.448*	-.507**	-.409	-.202
	Sig. (2-tailed)	.001	.001		.004	.013	.005	.314	.334
	N	30	30	30	30	30	29	8	25
Median Year of Structure Built	Pearson Correlation	-.605**	.072	.509**	1	.186	-.508**	-.678	-.250
	Sig. (2-tailed)	.000	.704	.004		.325	.005	.065	.229
	N	30	30	30	30	30	29	8	25
Median Householder Income	Pearson Correlation	-.492**	.484**	.448*	.186	1	-.623**	.292	-.263
	Sig. (2-tailed)	.006	.007	.013	.325		.000	.483	.204
	N	30	30	30	30	30	29	8	25
LN Below Poverty Level	Pearson Correlation	.778**	-.328	-.507**	-.508**	-.623**	1	-.137	.414*
	Sig. (2-tailed)	.000	.083	.005	.005	.000		.746	.040
	N	29	29	29	29	29	29	8	25
LN Household Crowding	Pearson Correlation	.200	.258	-.409	-.678	.292	-.137	1	.018
	Sig. (2-tailed)	.635	.537	.314	.065	.483	.746		.966
	N	8	8	8	8	8	8	8	8
LN Unemployment Rate	Pearson Correlation	.508**	-.211	-.202	-.250	-.263	.414*	.018	1
	Sig. (2-tailed)	.010	.312	.334	.229	.204	.040	.966	
	N	25	25	25	25	25	25	8	25

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 40. The result of the correlation analysis between the dependent variable (structural housing condition) and social capital variables

		Structural Housing Condition	Social Mobility	Marriage Rate	Own Children 18	LN Ethnic Diversity	Homeownership Rate	Voter Turnout	Housing Price Inequality	Crime Incidence N2	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
Structural Housing Condition	Pearson Correlation	1	-.792**	-.274	.348	.678**	-.505**	-.526**	.674**	.476**	.582**	.304	.368*
	Sig. (2-tailed)		.000	.143	.059	.000	.004	.003	.000	.008	.001	.102	.045
	N	30	30	30	30	30	30	30	30	30	30	30	30
Social Mobility	Pearson Correlation	-.792**	1	.430*	-.157	-.597**	.442*	.506**	-.594**	-.282	-.427*	-.289	-.328
	Sig. (2-tailed)	.000		.018	.407	.000	.015	.004	.001	.131	.019	.122	.076
	N	30	30	30	30	30	30	30	30	30	30	30	30
Marriage Rate	Pearson Correlation	-.274	.430*	1	.588**	-.196	.678**	.529**	-.073	.025	-.112	-.213	-.219
	Sig. (2-tailed)	.143	.018		.001	.300	.000	.003	.701	.895	.554	.259	.246
	N	30	30	30	30	30	30	30	30	30	30	30	30
Own Children 18	Pearson Correlation	.348	-.157	.588**	1	.350	.157	.014	.226	.206	.272	-.049	.005
	Sig. (2-tailed)	.059	.407	.001		.058	.406	.941	.230	.276	.146	.797	.978
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Ethnic Diversity	Pearson Correlation	.678**	-.597**	-.196	.350	1	-.669**	-.735**	.448*	.480**	.580**	.242	.308
	Sig. (2-tailed)	.000	.000	.300	.058		.000	.000	.013	.007	.001	.197	.097
	N	30	30	30	30	30	30	30	30	30	30	30	30
Homeownership Rate	Pearson Correlation	-.505**	.442*	.678**	.157	-.669**	1	.850**	-.251	-.233	-.368*	-.201	-.241
	Sig. (2-tailed)	.004	.015	.000	.406	.000		.000	.180	.215	.046	.287	.200
	N	30	30	30	30	30	30	30	30	30	30	30	30
Voter Turnout	Pearson Correlation	-.526**	.506**	.529**	.014	-.735**	.850**	1	-.302	-.313	-.460*	-.202	-.234
	Sig. (2-tailed)	.003	.004	.003	.941	.000	.000		.105	.092	.011	.285	.213
	N	30	30	30	30	30	30	30	30	30	30	30	30
Housing Price Inequality	Pearson Correlation	.674**	-.594**	-.073	.226	.448*	-.251	-.302	1	.410*	.410*	.346	.383*
	Sig. (2-tailed)	.000	.001	.701	.230	.013	.180	.105		.024	.025	.061	.036
	N	30	30	30	30	30	30	30	30	30	30	30	30
Crime Incidence N2	Pearson Correlation	.476**	-.282	.025	.206	.480**	-.233	-.313	.410*	1	.930**	.681**	.743**
	Sig. (2-tailed)	.008	.131	.895	.276	.007	.215	.092	.024		.000	.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Incidence N3	Pearson Correlation	.582**	-.427*	-.112	.272	.580**	-.368*	-.460*	.410*	.930**	1	.666**	.745**
	Sig. (2-tailed)	.001	.019	.554	.146	.001	.046	.011	.025	.000		.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD1	Pearson Correlation	.304	-.289	-.213	-.049	.242	-.201	-.202	.346	.681**	.666**	1	.984**
	Sig. (2-tailed)	.102	.122	.259	.797	.197	.287	.285	.061	.000	.000		.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD2	Pearson Correlation	.368*	-.328	-.219	.005	.308	-.241	-.234	.383*	.743**	.745**	.984**	1
	Sig. (2-tailed)	.045	.076	.246	.978	.097	.200	.213	.036	.000	.000	.000	
	N	30	30	30	30	30	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 40 shows the three components extracted from the components analysis along with their Eigenvalues, the percent of variance attributable to each component, and the cumulative variance of the component and the previous components. The first rotated component accounts for 34.273% of the variance, the second rotated component 30.680%, and the third rotated component 15.566%.

	Component		
	1	2	3
LN Crime Loss and Damage LD2	.963	-.126	-.021
LN Crime Loss and Damage LD1	.945	-.082	-.086
Crime Incidence N2	.845	-.196	.260
LN Crime Incidence N3	.799	-.351	.298
Voter Turnout	-.133	.926	.034
Homeownership Rate	-.115	.917	.201
LN Ethnic Diversity	.222	-.795	.405
Social Mobility	-.226	.640	-.349
Own Children Under 18 Years Old	-.005	.053	.916
Housing Price Inequality	.353	-.376	.475

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 41. Varimax Rotated Component Matrix for social capital variables in the second block group-level analysis

Table 41 shows the loadings of the ten social capital variables on the three components extracted. The higher the absolute value of the loading, the more the variable contributes to the component. The variables with loadings that are less than 0.5 are regarded as lesser contributing variables to components. So, crime loss and damage LD1, crime loss and damage LD2, crime incidence N2, and crime incidence N3 are substantially loaded on Component 1. And, voter turnout, homeownership rate, ethnic diversity, and social mobility are substantially loaded on Component 2. Finally, the variable of own children under 18 years old is substantially loaded on Component 3. These three components represented by rotated component scores will be used as independent variables for multiple regression analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.626
Bartlett's Test of Sphericity	Approx. Chi-Square	34.247
	df	10
	Sig.	.000

Table 42. KMO and Bartlett's test in the components analysis for neighborhood characteristics variables in the second block group-level analysis

Based on the Table 42, the results of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity for the second components analysis in the second block group-level analysis shows that conducting components analysis in the data set of neighborhood characteristics variables is appropriate.

In the second block group-level analysis (dependent variable: structural housing condition), the result of the second components analysis for finding components from neighborhood characteristics variables are as follows.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.598	51.966	51.966	2.598	51.966	51.966	1.783	35.661	35.661
2	.874	17.479	69.446	.874	17.479	69.446	1.689	33.785	69.446
3	.831	16.616	86.062						
4	.465	9.305	95.367						
5	.232	4.633	100.000						

Extraction Method: Principal Component Analysis.

Table 43. Proportion of variance summarized in the components analysis for neighborhood characteristics variables in the second block group-level analysis

Table 43 shows the two components extracted from the components analysis in the data set of neighborhood characteristics variables. The first rotated component accounts for 35.661% of total variance, and the second rotated component accounts for 33.785% of total variance.

	Component	
	1	2
LN Unemployment Rate	.776	.030
LN Below Poverty Level	.760	-.429
Median Householder Income	-.720	.361
Median Year of Structure Built	-.086	.842
Median Home Value	-.278	.816

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 44. Varimax Rotated Component Matrix for neighborhood characteristics variables in the second block group-level analysis

Table 44 shows the loadings of the five neighborhood characteristics variables on the two components extracted. Unemployment rate, below poverty level, and median householder income are substantially loaded on Component 1. On the other hand, median built year and median home value are substantially loaded on Component 2. These two components represented by rotated component scores will be used as variables for multiple regression analysis. According to Table 43 and Table 44, the results of the second components analysis in the second block group-level analysis (dependent variable: structural housing condition) show that there are two components extracted from the neighborhood characteristics variables.

As a last step, we conducted multiple regression analysis using the components obtained from each components analysis (social capital group and neighborhood characteristics group) in the second block group-level analysis.

Dependent variable: structural housing condition

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value
(Constant)	.826		.000
Neighborhood_characteristics_Component 1**	.188	.439	.042
Neighborhood_characteristics_Component 2	-.092	-.214	.146
Social_capital_Component 1	.033	.070	.663
Social_capital_Component 2	-.104	-.246	.162
Social_capital_Component 3**	.186	.463	.001

R^2 = 0.788, adjusted R^2 = 0.732, F-ratio = 14.141, n = 30.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 45. The results of the multiple regression in the second block group-level analysis

Table 45 above shows that one (Neighborhood characteristics Component 1) of the components extracted from neighborhood characteristics variables has statistically significant influence on structural housing condition at a 5% significance level. Based on Standardized Coefficients (Beta) of the component, one standard deviation change in the Neighborhood characteristics Component1 is associated with 0.439 standard deviation change in the dependent variable (structural housing condition) while controlling for all the other components. Also, one (Social capital Component 3) of the components extracted from social capital variables has a statistically significant impact on structural housing condition at a significance level of 5 % as well. The Standardized Coefficients (Beta) of the component shows that one standard deviation change in the Social capital Component 3 is associated with 0.463 standard deviation change in the dependent variable (structural housing condition) while controlling for all the other components. Thus, we can infer that a particular aspect of social capital represented by the third component (Social capital Component 3) has an impact on managing structural housing condition. The social capital variable of own children under 18 years old is substantially loaded on the third component.

Dependent Variable 3: Non-Structural Housing Condition

The third dependent variable for the block group-level analysis is non-structural housing condition. Non-structural housing condition is related to dwelling environment, such as yard, fence, driveway, and sidewalk.

The procedure to obtain the dependent variable (non-structural housing condition) is the same as for the former two dependent variables (total housing condition and structural housing condition). Two interim composite scores from the two sections: yard/fence and driveway/sidewalk, are combined to make a single composite score for non-structural housing condition.

Likewise, in the third block group-level analysis, we firstly tested the normality of the dependent variable (i.e., non-structural housing condition). Table 46 shows that the dependent variable is normally distributed.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Non-Structural Housing Condition	.216	8	.200*	.938	8	.594

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 46. Normality test of the dependent variable (Non-structural housing condition)

The next step is to identify the variables which will be used in components analysis. Only relevant variables having a relationship with other independent variables including the dependent variable will be used. Correlation analysis will help to identify the variables for the components analysis.

In the third block group-level analysis, we also conducted two correlation analyses for two groups of independent variables (neighborhood characteristics variables and social capital variables). The result of the first correlation analysis

(Table 47) including the dependent variable (i.e., non-structural housing condition) and neighborhood characteristics variables reveals that only two variables are valid to be used in components analysis: education attainment and household crowding. In the second correlation analysis including the dependent variable and social capital variables, just two variables (voter turnout and housing price inequality) are related to the dependent variable.

Thus, we conducted separate components analyses to extract components from each group of independent variables for this section of the analysis.

Before we obtain the components (represented by rotated component scores) from each group of independent variables through components analysis, however, we examine whether it is appropriate to conduct components analysis. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity help to assess the appropriateness of the components analyses from each group of independent variables. According to the table (Table 49), the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.5, and the significance value for the Bartlett's Test of Sphericity in the data set of social capital variables is over 0.05. So, we do not reject the null hypothesis. In other words, social capital variables in the data set are uncorrelated. Thus, it is not appropriate to conduct components analysis in the group of social capital variables. The two social capital variables can be used as independent variables for a multiple regression analysis.

Table 47. The result of the correlation analysis between the dependent variable (non-structural housing condition) and neighborhood characteristics variables

		Non-Structural Housing Condition	LN Education Attainment Rate	Median Home Value	Median Year of Structure Built	Median Householder Income	LN Below Poverty Level	LN Household Crowding	LN Unemployment Rate
Non-Structural Housing Condition	Pearson Correlation	1	-.410*	-.297	-.106	-.223	.293	-.483	.191
	Sig. (2-tailed)		.024	.111	.577	.237	.123	.226	.361
	N	30	30	30	30	30	29	8	25
LN Education Attainment Rate	Pearson Correlation	-.410*	1	.566**	.072	.484**	-.328	.258	-.211
	Sig. (2-tailed)	.024		.001	.704	.007	.083	.537	.312
	N	30	30	30	30	30	29	8	25
Median Home Value	Pearson Correlation	-.297	.566**	1	.509**	.448*	-.507**	-.409	-.202
	Sig. (2-tailed)	.111	.001		.004	.013	.005	.314	.334
	N	30	30	30	30	30	29	8	25
Median Year of Structure Built	Pearson Correlation	-.106	.072	.509**	1	.186	-.508**	-.678	-.250
	Sig. (2-tailed)	.577	.704	.004		.325	.005	.065	.229
	N	30	30	30	30	30	29	8	25
Median Householder Income	Pearson Correlation	-.223	.484**	.448*	.186	1	-.623**	.292	-.263
	Sig. (2-tailed)	.237	.007	.013	.325		.000	.483	.204
	N	30	30	30	30	30	29	8	25
LN Below Poverty Level	Pearson Correlation	.293	-.328	-.507**	-.508**	-.623**	1	-.137	.414*
	Sig. (2-tailed)	.123	.083	.005	.005	.000		.746	.040
	N	29	29	29	29	29	29	8	25
LN Household Crowding	Pearson Correlation	-.483	.258	-.409	-.678	.292	-.137	1	.018
	Sig. (2-tailed)	.226	.537	.314	.065	.483	.746		.966
	N	8	8	8	8	8	8	8	8
LN Unemployment Rate	Pearson Correlation	.191	-.211	-.202	-.250	-.263	.414*	.018	1
	Sig. (2-tailed)	.361	.312	.334	.229	.204	.040	.966	
	N	25	25	25	25	25	25	8	25

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Table 48. The result of the correlation analysis between the dependent variable (non-structural housing condition) and social capital variables

		Non-Structural Housing Condition	Social Mobility	Marriage Rate	Own Children 18	LN Ethnic Diversity	Homeownership Rate	Voter Turnout	Housing Price Inequality	Crime Incidence N2	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
Non-Structural Housing Condition	Pearson Correlation	1	-.272	-.142	.180	.280	-.258	-.384*	.359	.185	.209	.147	.151
	Sig. (2-tailed)		.146	.455	.341	.134	.169	.036	.051	.328	.267	.438	.425
	N	30	30	30	30	30	30	30	30	30	30	30	30
Social Mobility	Pearson Correlation	-.272	1	.430*	-.157	-.597**	.442*	.506**	-.594**	-.282	-.427*	-.289	-.328
	Sig. (2-tailed)	.146		.018	.407	.000	.015	.004	.001	.131	.019	.122	.076
	N	30	30	30	30	30	30	30	30	30	30	30	30
Marriage Rate	Pearson Correlation	-.142	.430*	1	.588**	-.196	.678**	.529**	-.073	.025	-.112	-.213	-.219
	Sig. (2-tailed)	.455	.018		.001	.300	.000	.003	.701	.895	.554	.259	.246
	N	30	30	30	30	30	30	30	30	30	30	30	30
Own Children 18	Pearson Correlation	.180	-.157	.588**	1	.350	.157	.014	.226	.206	.272	-.049	.005
	Sig. (2-tailed)	.341	.407	.001		.058	.406	.941	.230	.276	.146	.797	.978
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Ethnic Diversity	Pearson Correlation	.280	-.597**	-.196	.350	1	-.669**	-.735**	.448*	.480**	.580**	.242	.308
	Sig. (2-tailed)	.134	.000	.300	.058		.000	.000	.013	.007	.001	.197	.097
	N	30	30	30	30	30	30	30	30	30	30	30	30
Homeownership Rate	Pearson Correlation	-.258	.442*	.678**	.157	-.669**	1	.850**	-.251	-.233	-.368*	-.201	-.241
	Sig. (2-tailed)	.169	.015	.000	.406	.000		.000	.180	.215	.046	.287	.200
	N	30	30	30	30	30	30	30	30	30	30	30	30
Voter Turnout	Pearson Correlation	-.384*	.506**	.529**	.014	-.735**	.850**	1	-.302	-.313	-.460*	-.202	-.234
	Sig. (2-tailed)	.036	.004	.003	.941	.000	.000		.105	.092	.011	.285	.213
	N	30	30	30	30	30	30	30	30	30	30	30	30
Housing Price Inequality	Pearson Correlation	.359	-.594**	-.073	.226	.448*	-.251	-.302	1	.410*	.410*	.346	.383*
	Sig. (2-tailed)	.051	.001	.701	.230	.013	.180	.105		.024	.025	.061	.036
	N	30	30	30	30	30	30	30	30	30	30	30	30
Crime Incidence N2	Pearson Correlation	.185	-.282	.025	.206	.480**	-.233	-.313	.410*	1	.930**	.681**	.743**
	Sig. (2-tailed)	.328	.131	.895	.276	.007	.215	.092	.024		.000	.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Incidence N3	Pearson Correlation	.209	-.427*	-.112	.272	.580**	-.368*	-.460*	.410*	.930**	1	.666**	.745**
	Sig. (2-tailed)	.267	.019	.554	.146	.001	.046	.011	.025	.000		.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD1	Pearson Correlation	.147	-.289	-.213	-.049	.242	-.201	-.202	.346	.681**	.666**	1	.984**
	Sig. (2-tailed)	.438	.122	.259	.797	.197	.287	.285	.061	.000	.000		.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD2	Pearson Correlation	.151	-.328	-.219	.005	.308	-.241	-.234	.383*	.743**	.745**	.984**	1
	Sig. (2-tailed)	.425	.076	.246	.978	.097	.200	.213	.036	.000	.000	.000	
	N	30	30	30	30	30	30	30	30	30	30	30	30

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	2.621
	df	1
	Sig.	.105

Table 49. KMO and Bartlett's test in the components analysis for social capital variables in the third block group-level analysis

In the third block group-level analysis (dependent variable: non-structural housing condition), the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity from the group of neighborhood characteristics variables were checked before conducting components analysis to obtain components from the group. According to Table 50, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.5, and the significance value for the Bartlett's Test of Sphericity in the data set of neighborhood characteristics variables is 0.538 which is over 0.05. We can infer that neighborhood characteristics variables in the data set are uncorrelated with each other. Thus, conducting components analysis in the group of neighborhood characteristics variables to obtain components is not appropriate. The two neighborhood characteristics variables (education attainment rate and household crowding) are used as independent variables for a multiple regression analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	.379
	df	1
	Sig.	.538

Table 50. KMO and Bartlett's test in the components analysis for neighborhood characteristics variables in the third block group-level analysis

Table 49 and Table 50 show that conducting a separate components analysis in each group of independent variables is not appropriate based on the values of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the significance values for the Bartlett's Test of Sphericity. Thus, a multiple regression analysis was conducted using the four relevant and valid independent variables, whose correlation coefficients are over 0.3 based on each correlation analysis (social capital group and neighborhood characteristics group). In the group of social capital variables, there are two relevant independent variables used: voter turnout and housing price inequality. In the group of neighborhood characteristics variables, there are also two relevant and valid independent variables used: education attainment rate and household crowding. According to Table 51, none of the social capital variables and neighborhood characteristics variables have a statistically significant impact on managing non-structural housing condition at a 5% significance level.

Dependent variable: non-structural housing condition

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	-.392		.878	
LN Education Attainment Rate	-.959	-.705	.200	1.456
LN Household Crowding	-.372	-.356	.426	1.188
Voter Turnout	.575	.149	.759	1.554
Housing Price Inequality	-.527	-.031	.937	1.055

R^2 = 0.619, adjusted R^2 = 0.112, F-ratio = 1.220, n = 30.
* Indicate statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 51. The results of the multiple regression in the third block group-level analysis

Dependent Variable 4: The Exterior Condition of Housing Section

The next dependent variable is the exterior condition of housing section. As mentioned previously, there are four sections composing dwelling structure and environment. The exterior condition of housing section is one of the structural housing conditions (dwelling structure). Vacancy, house paint peeling, structural (siding and foundation) problems, problems in gutters, fascia, and soffits, broken doors or windows, deteriorating roof or chimney, deteriorating porch and unnecessary items on the porch, and graffiti on a house, are the issues investigated to assess the exterior condition of housing section. And, in order to summarize the exterior condition of housing section, scores from each question in the housing exterior section are combined to make a single interim composite score.

In the fourth block group-level analysis, a normality test of the dependent variable (i.e., the condition of housing exterior section) is first conducted. According to Table 52 below, the dependent variable is not normally distributed.

Thus, a log data transformation was performed by using a calculation tool (i.e., log transformation) in SPSS. The variable was found to be normal after transformation, as shown in Table 52.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
LN Housing Exterior Condition	.227	8	.200*	.888	8	.225

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 52. Normality test of the Log transformed dependent variable
(The exterior condition of housing section)

After the normality test of the dependent variable, finding variables which will be used in components analysis is investigated through correlation analysis. Likewise, in the fourth block group-level analysis, correlation analyses are conducted for each group of variables (neighborhood characteristics group and social capital group) respectively. From the results of the first correlation analysis (Table 53) including the dependent variable (i.e., condition of housing exterior) and the neighborhood characteristics variables, five variables are identified as valid for being used in components analysis: median home value, median year of structure built, median householder income, below poverty level, and unemployment rate. The second correlation analysis, including the dependent variable and social capital variables, shows that nine variables (social mobility, marriage rate, ethnic diversity, homeownership rate, voter turnout, housing price inequality, crime incidence N2, crime incidence N3, and crime loss & damage LD2) are valid for use in the components analysis.

In the fourth block group-level analysis, according to Table 53 and Table 54, the results of the correlation analyses show that nine and five variables for each group (i.e., social capital group and neighborhood characteristics group) are appropriate variables to be used in each components analysis to obtain components. However, before conducting components analysis, it is necessary to examine the appropriateness of components analysis through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity.

According to Table 55 below, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.701, and the significance value for the Bartlett's Test of Sphericity is 0.000 which is less than 0.05. It shows that conducting components analysis in the data set of social capital variables is appropriate.

Table 53. The result of the correlation analysis between the dependent variable (condition of housing exterior) and neighborhood characteristics variables

		LN Housing Exterior Condition	LN Education Attainment Rate	Median Home Value	Median Year of Structure Built	Median Householder Income	LN Below Poverty Level	LN Household Crowding	LN Unemployment Rate
LN Housing Exterior Condition	Pearson Correlation	1	-.284	-.565**	-.532**	-.367*	.762**	.128	.466*
	Sig. (2-tailed)		.128	.001	.002	.046	.000	.763	.019
	N	30	30	30	30	30	29	8	25
LN Education Attainment Rate	Pearson Correlation	-.284	1	.566**	.072	.484**	-.328	.258	-.211
	Sig. (2-tailed)	.128		.001	.704	.007	.083	.537	.312
	N	30	30	30	30	30	29	8	25
Median Home Value	Pearson Correlation	-.565**	.566**	1	.509**	.448*	-.507**	-.409	-.202
	Sig. (2-tailed)	.001	.001		.004	.013	.005	.314	.334
	N	30	30	30	30	30	29	8	25
Median Year of Structure Built	Pearson Correlation	-.532**	.072	.509**	1	.186	-.508**	-.678	-.250
	Sig. (2-tailed)	.002	.704	.004		.325	.005	.065	.229
	N	30	30	30	30	30	29	8	25
Median Householder Income	Pearson Correlation	-.367*	.484**	.448*	.186	1	-.623**	.292	-.263
	Sig. (2-tailed)	.046	.007	.013	.325		.000	.483	.204
	N	30	30	30	30	30	29	8	25
LN Below Poverty Level	Pearson Correlation	.762**	-.328	-.507**	-.508**	-.623**	1	-.137	.414*
	Sig. (2-tailed)	.000	.083	.005	.005	.000		.746	.040
	N	29	29	29	29	29	29	8	25
LN Household Crowding	Pearson Correlation	.128	.258	-.409	-.678	.292	-.137	1	.018
	Sig. (2-tailed)	.763	.537	.314	.065	.483	.746		.966
	N	8	8	8	8	8	8	8	8
LN Unemployment Rate	Pearson Correlation	.466*	-.211	-.202	-.250	-.263	.414*	.018	1
	Sig. (2-tailed)	.019	.312	.334	.229	.204	.040	.966	
	N	25	25	25	25	25	25	8	25

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 54. The result of the correlation analysis between the dependent variable (condition of housing exterior) and social capital variables

		LN Housing Exterior Condition	Social Mobility	Marriage Rate	Own Children 18	LN Ethnic Diversity	Homeownership Rate	Voter Turnout	Housing Price Inequality	Crime Incidence N2	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
LN Housing Exterior Condition	Pearson Correlation	1	-.726**	-.365*	.259	.471**	-.434*	-.418*	.596**	.403*	.509**	.256	.326
	Sig. (2-tailed)		.000	.047	.168	.009	.017	.021	.001	.027	.004	.172	.079
	N	30	30	30	30	30	30	30	30	30	30	30	30
Social Mobility	Pearson Correlation	-.726**	1	.430*	-.157	-.597**	.442*	.506**	-.594**	-.282	-.427*	-.289	-.328
	Sig. (2-tailed)	.000		.018	.407	.000	.015	.004	.001	.131	.019	.122	.076
	N	30	30	30	30	30	30	30	30	30	30	30	30
Marriage Rate	Pearson Correlation	-.365*	.430*	1	.588**	-.196	.678**	.529**	-.073	.025	-.112	-.213	-.219
	Sig. (2-tailed)	.047	.018		.001	.300	.000	.003	.701	.895	.554	.259	.246
	N	30	30	30	30	30	30	30	30	30	30	30	30
Own Children 18	Pearson Correlation	.259	-.157	.588**	1	.350	.157	.014	.226	.206	.272	-.049	.005
	Sig. (2-tailed)	.168	.407	.001		.058	.406	.941	.230	.276	.146	.797	.978
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Ethnic Diversity	Pearson Correlation	.471**	-.597**	-.196	.350	1	-.669**	-.735**	.448*	.480**	.580**	.242	.308
	Sig. (2-tailed)	.009	.000	.300	.058		.000	.000	.013	.007	.001	.197	.097
	N	30	30	30	30	30	30	30	30	30	30	30	30
Homeownership Rate	Pearson Correlation	-.434*	.442*	.678**	.157	-.669**	1	.850**	-.251	-.233	-.368*	-.201	-.241
	Sig. (2-tailed)	.017	.015	.000	.406	.000		.000	.180	.215	.046	.287	.200
	N	30	30	30	30	30	30	30	30	30	30	30	30
Voter Turnout	Pearson Correlation	-.418*	.506**	.529**	.014	-.735**	.850**	1	-.302	-.313	-.460*	-.202	-.234
	Sig. (2-tailed)	.021	.004	.003	.941	.000	.000		.105	.092	.011	.285	.213
	N	30	30	30	30	30	30	30	30	30	30	30	30
Housing Price Inequality	Pearson Correlation	.596**	-.594**	-.073	.226	.448*	-.251	-.302	1	.410*	.410*	.346	.383*
	Sig. (2-tailed)	.001	.001	.701	.230	.013	.180	.105		.024	.025	.061	.036
	N	30	30	30	30	30	30	30	30	30	30	30	30
Crime Incidence N2	Pearson Correlation	.403*	-.282	.025	.206	.480**	-.233	-.313	.410*	1	.930**	.681**	.743**
	Sig. (2-tailed)	.027	.131	.895	.276	.007	.215	.092	.024		.000	.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Incidence N3	Pearson Correlation	.509**	-.427*	-.112	.272	.580**	-.368*	-.460*	.410*	.930**	1	.666**	.745**
	Sig. (2-tailed)	.004	.019	.554	.146	.001	.046	.011	.025	.000		.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD1	Pearson Correlation	.256	-.289	-.213	-.049	.242	-.201	-.202	.346	.681**	.666**	1	.984**
	Sig. (2-tailed)	.172	.122	.259	.797	.197	.287	.285	.061	.000	.000		.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD2	Pearson Correlation	.326	-.328	-.219	.005	.308	-.241	-.234	.383*	.743**	.745**	.984**	1
	Sig. (2-tailed)	.079	.076	.246	.978	.097	.200	.213	.036	.000	.000	.000	
	N	30	30	30	30	30	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.701
Bartlett's Test of Sphericity	Approx. Chi-Square	204.485
	df	36
	Sig.	.000

Table 55. KMO and Bartlett's test in the components analysis for social capital variables in the fourth block group-level analysis

In the fourth block group-level analysis (dependent variable: the condition of housing exterior), the result of the first components analysis using the nine social capital variables shows that there are two components.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.526	50.288	50.288	4.526	50.288	50.288	3.250	36.113	36.113
2	1.861	20.678	70.966	1.861	20.678	70.966	3.137	34.854	70.966
3	.961	10.679	81.645						
4	.788	8.751	90.397						
5	.370	4.113	94.510						
6	.214	2.382	96.892						
7	.149	1.659	98.550						
8	.084	.929	99.479						
9	.047	.521	100.000						

Extraction Method: Principal Component Analysis.

Table 56. Proportion of variance summarized in the components analysis for social capital variables in the fourth block group-level analysis

Table 56 shows the two components extracted from the components analysis along with their Eigenvalues, the percent of variance attributable to each component, and the cumulative variance of the component and the previous component. The first rotated component explains 36.113% of total variance, and the second rotated component explains 34.854% of total variance.

	Component	
	1	2
Crime Incidence N2	.944	-.036
LN Crime Incidence N3	.918	-.215
LN Crime Loss and Damage LD2	.819	-.094
Housing Price Inequality	.572	-.275
Homeownership Rate	-.156	.912
Voter Turnout	-.258	.867
Marriage Rate	.101	.781
LN Ethnic Diversity	.507	-.651
Social Mobility	-.399	.623

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 57. Varimax Rotated Structure Matrix for social capital variables in the fourth block group-level analysis

Table 57 shows the loadings of the nine social capital variables on the two components extracted. The higher the absolute value of the loading, the more the variable contributes to the component. The variables with loadings that are less than 0.5 are regarded as less contributing variables to components. Crime incidence N2, crime incidence N3, crime loss and damage LD2, housing price inequality, and ethnic diversity are substantially loaded on Component 1. While homeownership rate, voter turnout, marriage rate, ethnic diversity, and social mobility are substantially loaded on Component 2. These two components represented by rotated component scores will be used as variables for multiple regression analysis. Table 56 and Table 57 above show that the nine social capital variables are grouped into two components based on their own characteristics.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.626
Bartlett's Test of Sphericity	Approx. Chi-Square	34.247
	df	10
	Sig.	.000

Table 58. KMO and Bartlett's test in the components analysis for neighborhood characteristics variables in the fourth block group-level analysis

Also, in Table 58 above, the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity for the second components analysis in the fourth block group-level analysis (dependent variable: condition of housing exterior) show that the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.626, and the significance value for the Bartlett's Test of Sphericity in the data set of neighborhood characteristics variables is less than 0.05. It is inferred that neighborhood characteristics variables in the data set are correlated with each other. Thus it is appropriate for conducting components analysis in the group of neighborhood characteristics variables to obtain components.

Another components analysis was conducted to obtain components from neighborhood characteristics variables in the fourth block group-level analysis. The result of the second components analysis using neighborhood characteristics variables is as follows.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.598	51.966	51.966	2.598	51.966	51.966	1.783	35.661	35.661
2	.874	17.479	69.446	.874	17.479	69.446	1.689	33.785	69.446
3	.831	16.616	86.062						
4	.465	9.305	95.367						
5	.232	4.633	100.000						

Extraction Method: Principal Component Analysis.

Table 59. Proportion of variance summarized in the components analysis for neighborhood characteristics variables in the fourth block group-level analysis

Table 59 shows the two components extracted from the components analysis for neighborhood characteristics variables in the fourth block group-level analysis. The first rotated component accounts for 35.661% of total variance, and the second rotated component explains 33.785% of total variance.

	Component	
	1	2
LN Unemployment Rate	.776	.030
LN Below Poverty Level	.760	-.429
Median Householder Income	-.720	.361
Median Year of Structure Built	-.086	.842
Median Home Value	-.278	.816

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 60. Varimax Rotated Structure Matrix for neighborhood characteristics variables in the fourth block group-level analysis

Table 60 shows the loadings of the five neighborhood characteristics variables on the two components extracted. Unemployment rate, below poverty level, and median householder income are substantially loaded on Component 1. On the other hand, median built year and median home value are substantially loaded on Component 2. These two components represented by rotated componet scores will be used as variables for multiple regression analysis. The five neighborhood characteristics variables are grouped into two components.

Using the results of the components analyses, we conducted a multiple regression analysis using the components obtained from each components analysis (social capital group and neighborhood characteristics group) as independent variables.

Dependent variable: the condition of housing exterior section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value
(Constant)	-.688		.000
Neighborhood_characteristics_Component 1	.137	.224	.380
Neighborhood_characteristics_Component 2	-.177	-.289	.112
Social_capital_Component 1*	.269	.431	.065
Social_capital_Component 2	-.109	-.173	.394

R^2 = 0.625, adjusted R^2 = 0.550, F-ratio = 8.342, n = 30.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 61. The results of the multiple regression analysis in the fourth block group-level analysis

Since each independent variable generally has different units of measurement, Standardized Coefficients (Beta) are used to compare the influences caused by each component summarizing neighborhood characteristics variables and social capital variables on housing exterior condition. Standardized regression coefficients helps to show how much a dependent variable is expected to increase or decrease the Z-score standard deviation units when an independent variable increases by one standard deviation unit while controlling all the other variables. According to Table 61, one (social capital Component 1) of the social capital components has a nearly statistically significant impact on the exterior condition of housing section (Beta = .431) at a significance level of 0.1. Based on Standardized Coefficients (Beta) of the component, one standard deviation change in the social capital Component 1 is associated with 0.431 standard deviation change in the dependent variable (housing exterior condition) while controlling all the other components. Thus, it can be inferred that a particular aspect of social capital, which is represented by the first social capital component (social capital Component 1), has some impact on the exterior condition of housing section. Crime incidence N2, crime incidence N3, crime loss and damage LD2, housing price inequality, and ethnic diversity are substantially loaded on the first social capital component.

Dependent Variable 5: The Condition of Garage Section

The next dependent variable is the condition of garage section. A garage is also one of the dwelling structures reflecting residents' quality of life. Garage structural problems, garage paint peeling, and broken garage doors or windows are issues dealt with in a survey to measure the overall condition of garage section. Interim composite score for the garage section was obtained by combining scores of each question.

Generally, the use of a garage is as storage for a car, which is different from the use of a house. Thus, it is expected that the difference in terms of usage between two dwelling structures may provide different statistics.

First, the normality of the dependent variable (i.e., the condition of garage section) was tested. Table 62 below shows the result of the normality test for the dependent variable. The dependent variable is normally distributed based on the result.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Garage Condition	.211	8	.200*	.907	8	.331

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 62. Normality test of the dependent variable (Condition of garage section)

After testing normality of the dependent variable, variables were identified as being related to other independent variables, including the dependent variable, through correlation analysis. The identified variables will be used in components analysis to obtain components for multiple regression analysis.

In the same manner as with other block group-level analyses, two correlation analyses were conducted in each group of variables (neighborhood characteristics group and social capital group) respectively. In the fifth block group-level analysis (dependent variable: the condition of garage section), the results of the first correlation analysis (Table 63) between the dependent variable and neighborhood characteristics variables shows that four variables are suitable to be used in components analysis: median home value, median year of structure built, median householder income, and below poverty level. Also, according to the second correlation analysis between the dependent variable and social capital variables, there are nine variables (social mobility, marriage rate, ethnic diversity, homeownership rate, voter turnout, housing price inequality, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD2) which are appropriate for use in the second components analysis to obtain components for inclusion in regression modeling.

Table 63. The result of the correlation analysis between the dependent variable (condition of garage section) and neighborhood characteristics variables

		Garage Condition	LN Education Attainment Rate	Median Home Value	Median Year of Structure Built	Median Householder Income	LN Below Poverty Level	LN Household Crowding	LN Unemployment Rate
Garage Condition	Pearson Correlation	1	-.150	-.513**	-.577**	-.406*	.651**	.210	.265
	Sig. (2-tailed)		.429	.004	.001	.026	.000	.617	.201
	N	30	30	30	30	30	29	8	25
LN Education Attainment Rate	Pearson Correlation	-.150	1	.566**	.072	.484**	-.328	.258	-.211
	Sig. (2-tailed)	.429		.001	.704	.007	.083	.537	.312
	N	30	30	30	30	30	29	8	25
Median Home Value	Pearson Correlation	-.513**	.566**	1	.509**	.448*	-.507**	-.409	-.202
	Sig. (2-tailed)	.004	.001		.004	.013	.005	.314	.334
	N	30	30	30	30	30	29	8	25
Median Year of Structure Built	Pearson Correlation	-.577**	.072	.509**	1	.186	-.508**	-.678	-.250
	Sig. (2-tailed)	.001	.704	.004		.325	.005	.065	.229
	N	30	30	30	30	30	29	8	25
Median Householder Income	Pearson Correlation	-.406*	.484**	.448*	.186	1	-.623**	.292	-.263
	Sig. (2-tailed)	.026	.007	.013	.325		.000	.483	.204
	N	30	30	30	30	30	29	8	25
LN Below Poverty Level	Pearson Correlation	.651**	-.328	-.507**	-.508**	-.623**	1	-.137	.414*
	Sig. (2-tailed)	.000	.083	.005	.005	.000		.746	.040
	N	29	29	29	29	29	29	8	25
LN Household Crowding	Pearson Correlation	.210	.258	-.409	-.678	.292	-.137	1	.018
	Sig. (2-tailed)	.617	.537	.314	.065	.483	.746		.966
	N	8	8	8	8	8	8	8	8
LN Unemployment Rate	Pearson Correlation	.265	-.211	-.202	-.250	-.263	.414*	.018	1
	Sig. (2-tailed)	.201	.312	.334	.229	.204	.040	.966	
	N	25	25	25	25	25	25	8	25

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 64. The result of the correlation analysis between the dependent variable (condition of garage section) and social capital variables

		Garage Condition	Social Mobility	Marriage Rate	Own Children 18	LN Ethnic Diversity	Homeownership Rate	Voter Turnout	Housing Price Inequality	Crime Incidence N2	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
Garage Condition	Pearson Correlation	1	-.635**	-.443*	.202	.404*	-.457*	-.390*	.361	.241	.433*	.300	.347
	Sig. (2-tailed)		.000	.014	.283	.027	.011	.033	.050	.200	.017	.107	.061
	N	30	30	30	30	30	30	30	30	30	30	30	30
Social Mobility	Pearson Correlation	-.635**	1	.430*	-.157	-.597**	.442*	.506**	-.594**	-.282	-.427*	-.289	-.328
	Sig. (2-tailed)	.000		.018	.407	.000	.015	.004	.001	.131	.019	.122	.076
	N	30	30	30	30	30	30	30	30	30	30	30	30
Marriage Rate	Pearson Correlation	-.443*	.430*	1	.588**	-.196	.678**	.529**	-.073	.025	-.112	-.213	-.219
	Sig. (2-tailed)	.014	.018		.001	.300	.000	.003	.701	.895	.554	.259	.246
	N	30	30	30	30	30	30	30	30	30	30	30	30
Own Children 18	Pearson Correlation	.202	-.157	.588**	1	.350	.157	.014	.226	.206	.272	-.049	.005
	Sig. (2-tailed)	.283	.407	.001		.058	.406	.941	.230	.276	.146	.797	.978
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Ethnic Diversity	Pearson Correlation	.404*	-.597**	-.196	.350	1	-.669**	-.735**	.448*	.480**	.580**	.242	.308
	Sig. (2-tailed)	.027	.000	.300	.058		.000	.000	.013	.007	.001	.197	.097
	N	30	30	30	30	30	30	30	30	30	30	30	30
Homeownership Rate	Pearson Correlation	-.457*	.442*	.678**	.157	-.669**	1	.850**	-.251	-.233	-.368*	-.201	-.241
	Sig. (2-tailed)	.011	.015	.000	.406	.000		.000	.180	.215	.046	.287	.200
	N	30	30	30	30	30	30	30	30	30	30	30	30
Voter Turnout	Pearson Correlation	-.390*	.506**	.529**	.014	-.735**	.850**	1	-.302	-.313	-.460*	-.202	-.234
	Sig. (2-tailed)	.033	.004	.003	.941	.000	.000		.105	.092	.011	.285	.213
	N	30	30	30	30	30	30	30	30	30	30	30	30
Housing Price Inequality	Pearson Correlation	.361	-.594**	-.073	.226	.448*	-.251	-.302	1	.410*	.410*	.346	.383*
	Sig. (2-tailed)	.050	.001	.701	.230	.013	.180	.105		.024	.025	.061	.036
	N	30	30	30	30	30	30	30	30	30	30	30	30
Crime Incidence N2	Pearson Correlation	.241	-.282	.025	.206	.480**	-.233	-.313	.410*	1	.930**	.681**	.743**
	Sig. (2-tailed)	.200	.131	.895	.276	.007	.215	.092	.024		.000	.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Incidence N3	Pearson Correlation	.433*	-.427*	-.112	.272	.580**	-.368*	-.460*	.410*	.930**	1	.666**	.745**
	Sig. (2-tailed)	.017	.019	.554	.146	.001	.046	.011	.025	.000		.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD1	Pearson Correlation	.300	-.289	-.213	-.049	.242	-.201	-.202	.346	.681**	.666**	1	.984**
	Sig. (2-tailed)	.107	.122	.259	.797	.197	.287	.285	.061	.000	.000		.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD2	Pearson Correlation	.347	-.328	-.219	.005	.308	-.241	-.234	.383*	.743**	.745**	.984**	1
	Sig. (2-tailed)	.061	.076	.246	.978	.097	.200	.213	.036	.000	.000	.000	
	N	30	30	30	30	30	30	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

According to Table 63 and Table 64, nine and four variables in each group (i.e., social capital group and neighborhood characteristics group) are identified from the correlation analyses. These thirteen variables are used to obtain components for each group of variables in separate components analyses.

However, before conducting components analysis, it is needed to examine the appropriateness of components analysis through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity.

Table 65 below shows that conducting components analysis in the data set of social capital variables is appropriate. According to the table, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.634 (over 0.5), and the significance value for the Bartlett's Test of Sphericity is less than 0.05.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.634
Bartlett's Test of Sphericity	Approx. Chi-Square	246.599
	Df	36
	Sig.	.000

Table 65. KMO and Bartlett's test in the components analysis for social capital variables in the fifth block group-level analysis

In the fifth block group-level analysis, the result of the first components analysis with social capital variables shows that there are three components. The nine social capital variables are grouped into three components based on the nine hidden characteristics of the variables.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.447	49.412	49.412	4.447	49.412	49.412	2.533	28.142	28.142
2	1.856	20.620	70.033	1.856	20.620	70.033	2.454	27.268	55.410
3	1.081	12.010	82.042	1.081	12.010	82.042	2.397	26.633	82.042
4	.778	8.639	90.681						
5	.374	4.153	94.834						
6	.222	2.462	97.296						
7	.152	1.694	98.990						
8	.083	.926	99.915						
9	.008	.085	100.000						

Extraction Method: Principal Component Analysis.

Table 66. Proportion of variance summarized in the components analysis for social capital variables in the fifth block group-level analysis

Table 66 shows the three components extracted from the components analysis along with their Eigenvalues, the percent of variance attributable to each component, and the cumulative variance of the component and the previous components. The first rotated component explains 28.142% of the variance, the second rotated component 27.268%, and the third rotated component 26.633%.

Table 67 shows the loadings of the nine social capital variables on the three components extracted. If the absolute value of the loading of a variable is higher, the variable contributes to the component more substantially. The variables with loadings that are less than 0.5 are regarded as lesser contributing variables to components.

	Component		
	1	2	3
LN Crime Loss and Damage LD2	.973	-.107	.169
LN Crime Loss and Damage LD1	.970	-.094	.103
LN Crime Incidence N3	.706	-.150	.482
Marriage Rate	-.145	.876	.072
Homeownership Rate	-.084	.875	-.348
Voter Turnout	-.075	.768	-.495
Housing Price Inequality	.256	.075	.799
LN Ethnic Diversity	.125	-.413	.776
Social Mobility	-.175	.337	-.716

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a. Rotation converged in 5 iterations.

Table 67. Varimax Rotated Structure Matrix for social capital variables in the fifth block group-level analysis

Crime loss and damage LD1, crime loss and damage LD2, and crime incidence N3 are substantially loaded on Component 1. Then marriage rate, homeownership rate, and voter turnout are substantially loaded on Component 2. Finally, housing price inequality, ethnic diversity, and social mobility are substantially loaded on Component 3. These three components represented by rotated component scores will be used as variables for multiple regression analysis. Table 66 and Table 67 show that there are three components extracted from nine social capital variables.

Table 68 below shows the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity for the second components analysis: the value of the KMO measure of sampling adequacy (0.626) and the significance value for the Bartlett's Test of Sphericity (0.000). One can infer that it is appropriate to conduct components analysis in the data set of neighborhood characteristics variables to obtain components.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.626
Bartlett's Test of Sphericity	Approx. Chi-Square	35.329
	df	6
	Sig.	.000

Table 68. KMO and Bartlett's test in the components analysis for neighborhood characteristics variables in the fifth block group-level analysis

In the fifth block group-level analysis, the second components analysis used neighborhood characteristics variables to extract other components. The result of the second components analysis using neighborhood characteristics variables is as follows.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.422	60.538	60.538	2.422	60.538	60.538	1.635	40.871	40.871
2	.841	21.016	81.554	.841	21.016	81.554	1.627	40.683	81.554
3	.474	11.841	93.395						
4	.264	6.605	100.000						

Extraction Method: Principal Component Analysis.

Table 69. Proportion of variance summarized in the components analysis for neighborhood characteristics variables in the fifth block group-level analysis

Table 69 shows the two components extracted from the components analysis in the data set of neighborhood characteristics variables. The first rotated component accounts for 40.871% of total variance, and the second rotated component accounts for 40.683% of total variance.

	Component	
	1	2
Median Year of Structure Built	.939	.066
Median Home Value	.715	.424
Median Householder Income	.074	.953
LN Below Poverty Level	-.485	-.731

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 70. Varimax Rotated Structure Matrix for neighborhood characteristics variables in the fifth block group-level analysis

According to Table 70, the loadings of the four neighborhood characteristics variables on the two components extracted are shown. Median built year and median home value are substantially loaded on Component 1. On the other hand, median householder income and below poverty level are substantially loaded on Component 2. In the fifth block group-level analysis, the four neighborhood characteristics variables are grouped into two components in the second components analysis.

The last step of the fifth block group-level analysis is multiple regression analysis. The components obtained from each components analysis are used to examine the impact of social capital on the condition of garage section.

Dependent variable: the condition of garage section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value
(Constant)	.206		.000
Neighborhood_characteristics_Component 1**	-.045	-.522	.007
Neighborhood_characteristics_Component 2	-.013	-.149	.555
Social_capital_Component 1	.009	.106	.545
Social_capital_Component 2	-.024	-.273	.209
Social_capital_Component 3	.010	.115	.564

R^2 = 0.529, adjusted R^2 = 0.426, F-ratio = 5.161, n = 30.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 71. The results of the multiple regression analysis in the fifth block group-level analysis

In the multiple regression analysis, Standardized Coefficients (Beta) are used to compare the influences caused by each component summarizing neighborhood characteristics variables and social capital variables on garage condition. Table 71 above shows that one (neighborhood characteristics Component 1) of the components extracted from neighborhood characteristics variables does have an influence on the condition of garage section at a 5% significance level. According to the Standardized Coefficients (Beta) of the component (neighborhood characteristics Component 1), one standard deviation change in the component (Neighborhood characteristics Component 1) is associated with -0.522 standard deviation change in the dependent variable (garage condition) while controlling for all the other components. However, the components obtained from the social capital variables do not have any statistically significant impact on the condition of garage section at a significance level of 0.05. Thus, one can infer that social capital represented by the three components does not have a statistically significant impact on the condition of garage as a component of dwelling structure.

Dependent Variable 6: The Condition of Yard and Fence section

The next dependent variable is the condition of yard and fence section. Yard and fence belong to the non-structural housing section which is regarded as dwelling environment. The questions dealt with in the survey were as follows. First, there are several questions regarding front yard condition: litter, grass over 10 inches tall, brush and overgrown weeds, and not managed (not arranged) housing appliances. Broken or leaning fence is another question dealt with in the yard and fence section. Some may think that a fence is one of the dwelling structures. However, the reason why a fence is classified as a dwelling environment aspect is that a fence does not take up any space in a house and does not need a complicated structure to build.

In the sixth block group-level analysis (dependent variable: the condition of yard and fence section), an interim composite score for the section of yard and fence was obtained by combining scores of each question (i.e., Yes = 2, No = 0, Major = 2, Minor = 1, and None = 0) to be used as the dependent variable.

A normality test of the dependent variable (i.e., the condition of yard/fence section) was conducted. The result of the test which is shown in Table 72 indicates that the dependent variable is normally distributed.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Yard and Fence Condition	.179	8	.200*	.938	8	.591

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 72. Normality test of the dependent variable (condition of yard/fence section)

By using a correlation analysis, it can be found which variables will be used in components analysis. As mentioned earlier, the variables which will be used in the components analysis should be associated with other independent variables including the dependent variable. Correlation coefficients of independent variables with the dependent variable should be over 0.3. Also, among correlation coefficients of an independent variable with the other independent variables, at least one coefficient should be 0.3. Otherwise, the independent variables could not be grouped to make components from components analysis.

In the sixth block group-level analysis, each correlation analysis for the two groups of independent variables (neighborhood characteristics variables and social capital variables) is conducted separately. The results of the first correlation analysis (Table 73) between the dependent variable (i.e., the condition of yard/fence section) and neighborhood characteristics variables show that there are four relevant and valid variables: education attainment rate, median home value, below poverty level, and household crowding. Also, in the second correlation analysis between the dependent variable and social capital variables, just two variables (voter turnout and housing price inequality) are correlated with the dependent variable.

Before conducting components analysis to extract components (represented by rotated component scores) from each group of independent variables, it is necessary to examine the appropriateness of the components analysis through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity.

According to Table 75, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.5, and the significance value for the Bartlett's Test of Sphericity in the data set of social capital variables is 0.105 which is over 0.05. Based on this, we do not reject the null hypothesis, which means that social capital variables in the data set are uncorrelated. Thus, it is not appropriate to conduct components analysis to extract components in the group of social capital variables. The two social capital variables are used as independent variables for a multiple regression analysis.

Table 73. The result of the correlation analysis between the dependent variable (Condition of yard/fence section) and neighborhood characteristics variables

		Yard and Fence Condition	LN Education Attainment Rate	Median Home Value	Median Year of Structure Built	Median Householder Income	LN Below Poverty Level	LN Household Crowding	LN Unemployment Rate
Yard and Fence Condition	Pearson Correlation	1	-.517**	-.332	-.109	-.212	.319	-.377	.149
	Sig. (2-tailed)		.003	.073	.566	.261	.091	.357	.476
	N	30	30	30	30	30	29	8	25
LN Education Attainment Rate	Pearson Correlation	-.517**	1	.566**	.072	.484**	-.328	.258	-.211
	Sig. (2-tailed)	.003		.001	.704	.007	.083	.537	.312
	N	30	30	30	30	30	29	8	25
Median Home Value	Pearson Correlation	-.332	.566**	1	.509**	.448*	-.507**	-.409	-.202
	Sig. (2-tailed)	.073	.001		.004	.013	.005	.314	.334
	N	30	30	30	30	30	29	8	25
Median Year of Structure Built	Pearson Correlation	-.109	.072	.509**	1	.186	-.508**	-.678	-.250
	Sig. (2-tailed)	.566	.704	.004		.325	.005	.065	.229
	N	30	30	30	30	30	29	8	25
Median Householder Income	Pearson Correlation	-.212	.484**	.448*	.186	1	-.623**	.292	-.263
	Sig. (2-tailed)	.261	.007	.013	.325		.000	.483	.204
	N	30	30	30	30	30	29	8	25
LN Below Poverty Level	Pearson Correlation	.319	-.328	-.507**	-.508**	-.623**	1	-.137	.414*
	Sig. (2-tailed)	.091	.083	.005	.005	.000		.746	.040
	N	29	29	29	29	29	29	8	25
LN Household Crowding	Pearson Correlation	-.377	.258	-.409	-.678	.292	-.137	1	.018
	Sig. (2-tailed)	.357	.537	.314	.065	.483	.746		.966
	N	8	8	8	8	8	8	8	8
LN Unemployment Rate	Pearson Correlation	.149	-.211	-.202	-.250	-.263	.414*	.018	1
	Sig. (2-tailed)	.476	.312	.334	.229	.204	.040	.966	
	N	25	25	25	25	25	25	8	25

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Table 74. The result of the correlation analysis between the dependent variable (Condition of yard/fence section) and social capital variables

		Yard and Fence Condition	Social Mobility	Marriage Rate	Own Children 18	LN Ethnic Diversity	Homeownership Rate	Voter Turnout	Housing Price Inequality	Crime Incidence N2	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
Yard and Fence Condition	Pearson Correlation	1	-.278	-.082	.208	.295	-.195	-.344	.406*	.219	.198	.203	.184
	Sig. (2-tailed)		.136	.668	.271	.114	.302	.062	.026	.245	.294	.281	.330
	N	30	30	30	30	30	30	30	30	30	30	30	30
Social Mobility	Pearson Correlation	-.278	1	.430*	-.157	-.597**	.442*	.506**	-.594**	-.282	-.427*	-.289	-.328
	Sig. (2-tailed)	.136		.018	.407	.000	.015	.004	.001	.131	.019	.122	.076
	N	30	30	30	30	30	30	30	30	30	30	30	30
Marriage Rate	Pearson Correlation	-.082	.430*	1	.588**	-.196	.678**	.529**	-.073	.025	-.112	-.213	-.219
	Sig. (2-tailed)	.668	.018		.001	.300	.000	.003	.701	.895	.554	.259	.246
	N	30	30	30	30	30	30	30	30	30	30	30	30
Own Children 18	Pearson Correlation	.208	-.157	.588**	1	.350	.157	.014	.226	.206	.272	-.049	.005
	Sig. (2-tailed)	.271	.407	.001		.058	.406	.941	.230	.276	.146	.797	.978
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Ethnic Diversity	Pearson Correlation	.295	-.597**	-.196	.350	1	-.669**	-.735**	.448*	.480**	.580**	.242	.308
	Sig. (2-tailed)	.114	.000	.300	.058		.000	.000	.013	.007	.001	.197	.097
	N	30	30	30	30	30	30	30	30	30	30	30	30
Homeownership Rate	Pearson Correlation	-.195	.442*	.678**	.157	-.669**	1	.850**	-.251	-.233	-.368*	-.201	-.241
	Sig. (2-tailed)	.302	.015	.000	.406	.000		.000	.180	.215	.046	.287	.200
	N	30	30	30	30	30	30	30	30	30	30	30	30
Voter Turnout	Pearson Correlation	-.344	.506**	.529**	.014	-.735**	.850**	1	-.302	-.313	-.460*	-.202	-.234
	Sig. (2-tailed)	.062	.004	.003	.941	.000	.000		.105	.092	.011	.285	.213
	N	30	30	30	30	30	30	30	30	30	30	30	30
Housing Price Inequality	Pearson Correlation	.406*	-.594**	-.073	.226	.448*	-.251	-.302	1	.410*	.410*	.346	.383*
	Sig. (2-tailed)	.026	.001	.701	.230	.013	.180	.105		.024	.025	.061	.036
	N	30	30	30	30	30	30	30	30	30	30	30	30
Crime Incidence N2	Pearson Correlation	.219	-.282	.025	.206	.480**	-.233	-.313	.410*	1	.930**	.681**	.743**
	Sig. (2-tailed)	.245	.131	.895	.276	.007	.215	.092	.024		.000	.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Incidence N3	Pearson Correlation	.198	-.427*	-.112	.272	.580**	-.368*	-.460*	.410*	.930**	1	.666**	.745**
	Sig. (2-tailed)	.294	.019	.554	.146	.001	.046	.011	.025	.000		.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD1	Pearson Correlation	.203	-.289	-.213	-.049	.242	-.201	-.202	.346	.681**	.666**	1	.984**
	Sig. (2-tailed)	.281	.122	.259	.797	.197	.287	.285	.061	.000	.000		.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD2	Pearson Correlation	.184	-.328	-.219	.005	.308	-.241	-.234	.383*	.743**	.745**	.984**	1
	Sig. (2-tailed)	.330	.076	.246	.978	.097	.200	.213	.036	.000	.000	.000	
	N	30	30	30	30	30	30	30	30	30	30	30	30

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.500
Bartlett's Test of Sphericity	Approx. Chi-Square	2.621
	df	1
	Sig.	.105

Table 75. KMO and Bartlett's test in the components analysis for social capital variables in the sixth block group-level analysis

The value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the significance value for the Bartlett's Test of Sphericity are examined before extracting components from the group of neighborhood characteristics variables in the components analysis. According to Table 76, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.190, and the significance value for the Bartlett's Test of Sphericity in the data set of neighborhood characteristics variables is 0.064. It can be inferred that neighborhood characteristics variables in the data set are uncorrelated with each other. Thus, conducting components analysis in the group of neighborhood characteristics variables to obtain components is not appropriate. The four neighborhood characteristics variables can be used as independent variables for a multiple regression analysis.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.190
Bartlett's Test of Sphericity	Approx. Chi-Square	11.923
	df	6
	Sig.	.064

Table 76. KMO and Bartlett's test in the components analysis for neighborhood characteristics variables in the sixth block group-level analysis

Table 75 and Table 76 show that conducting a separate components analysis in each group of independent variables is not appropriate based on the values of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the significance values for the Bartlett's Test of Sphericity.

Thus, a multiple regression analysis is conducted using the six relevant independent variables, whose correlation coefficients are over 0.3, from each correlation analysis (social capital group and neighborhood characteristics group). In the group of social capital variables, there are two relevant independent variables used: voter turnout and housing price inequality. In the group of neighborhood characteristics variables, there are also four relevant and valid independent variables used: education attainment rate, median home value, below poverty level, and household crowding. However, based on the VIF values of each social capital variable showing the possibility of multicollinearity effect (over 10.0), the variable of median home value is removed when conducting a multiple regression analysis.

Dependent variable: the condition of yard and fence section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	-1.959		.533	
LN Education Attainment Rate	-1.119	-.790	.236	1.678
LN Below Poverty Level	-.068	-.166	.814	2.905
LN Household Crowding	-.182	-.168	.722	1.268
Voter Turnout	.400	.100	.901	3.790
Housing Price Inequality	5.922	.339	.543	1.652

R^2 = 0.619, adjusted R^2 = 0.112, F-ratio = 1.220, n = 30.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 77. The results of the multiple regression in the sixth block group-level analysis

Since each independent variable generally has different units of measurement, Standardized Coefficients (Beta) are more useful when comparing the influences caused by each component summarizing neighborhood characteristics variables and social capital variables on the condition of yard and fence section. According to Table 77, none of the social capital variables and neighborhood characteristics variables have an impact on the condition of yard and fence section at a significance level of 0.05.

Dependent Variable 7: The Condition of Driveway and Sidewalk Section

The last dependent variable is the condition of driveway and sidewalk section. Driveway and sidewalk are non-structural housing sections. In the same manner as with yard and fence, they are also classified into dwelling environment.

First, in the driveway part, there are several questions in the survey: driveway cracks, bumps, and weeds. In the sidewalk part, cracks, bumps, weeds, and obstructing items (i.e., overgrown branch, shrub, etc) are investigated during the survey. Scores of each question are combined in order to make a single interim composite score for the condition of driveway and sidewalk section. The interim composite score is then used as the dependent variable.

In the last block group-level analysis, the normality of the dependent variable (i.e., the condition of driveway/sidewalk section) was tested first. According to Table 78, the dependent variable is normally distributed.

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Driveway and Sidewalk Condition	.204	8	.200*	.945	8	.664

*. This is a lower bound of the true significance.
a. Lilliefors Significance Correction

Table 78. Normality test of the dependent variable
(Condition of driveway/sidewalk section)

The next step is to find which variables will be used in components analysis through correlation analysis. Correlation analyses was conducted for two groups of independent variables (neighborhood characteristics variables and social capital variables). The result of the first correlation analysis (Table 80) between the dependent variable (i.e., the condition of driveway and sidewalk section) and neighborhood characteristics variables shows that there is no valid variable. No variables in the group of neighborhood characteristics variables are correlated with the dependent variable. In the second correlation analysis (Table 81) between the dependent variable and social capital variables, there is only one variable, voter turnout, found to be valid and relevant in the group of social capital variables. Thus, it is unwarranted to conduct a components analysis to extract components from each group of independent variables. Only one social capital variable (voter turnout) is directly used in a regression analysis to study the impact of the social capital variable on the condition of driveway and sidewalk. According to the results (Table 79), the variable of voter turnout does not have a statistically significant influence on the condition of driveway and sidewalk.

Dependent variable: the condition of driveway and sidewalk section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value
(Constant)	1.481		.000
Voter Turnout	-.605	-.306	.100

R^2 = 0.094, adjusted R^2 = 0.061, F-ratio = 2.896, n = 30.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 79. The results of the multiple regression in the seventh block group-level analysis

Table 80. The result of the correlation analysis between the dependent variable (Condition of driveway/sidewalk section) and neighborhood characteristics variables

		Driveway and Sidewalk Condition	LN Education Attainment Rate	Median Home Value	Median Year of Structure Built	Median Householder Income	LN Below Poverty Level	LN Household Crowding	LN Unemployment Rate
Driveway and Sidewalk Condition	Pearson Correlation	1	.042	-.074	-.050	-.148	.091	-.251	.190
	Sig. (2-tailed)		.825	.696	.792	.436	.638	.549	.363
	N	30	30	30	30	30	29	8	25
LN Education Attainment Rate	Pearson Correlation	.042	1	.566**	.072	.484**	-.328	.258	-.211
	Sig. (2-tailed)	.825		.001	.704	.007	.083	.537	.312
	N	30	30	30	30	30	29	8	25
Median Home Value	Pearson Correlation	-.074	.566**	1	.509**	.448*	-.507**	-.409	-.202
	Sig. (2-tailed)	.696	.001		.004	.013	.005	.314	.334
	N	30	30	30	30	30	29	8	25
Median Year of Structure Built	Pearson Correlation	-.050	.072	.509**	1	.186	-.508**	-.678	-.250
	Sig. (2-tailed)	.792	.704	.004		.325	.005	.065	.229
	N	30	30	30	30	30	29	8	25
Median Householder Income	Pearson Correlation	-.148	.484**	.448*	.186	1	-.623**	.292	-.263
	Sig. (2-tailed)	.436	.007	.013	.325		.000	.483	.204
	N	30	30	30	30	30	29	8	25
LN Below Poverty Level	Pearson Correlation	.091	-.328	-.507**	-.508**	-.623**	1	-.137	.414*
	Sig. (2-tailed)	.638	.083	.005	.005	.000		.746	.040
	N	29	29	29	29	29	29	8	25
LN Household Crowding	Pearson Correlation	-.251	.258	-.409	-.678	.292	-.137	1	.018
	Sig. (2-tailed)	.549	.537	.314	.065	.483	.746		.966
	N	8	8	8	8	8	8	8	8
LN Unemployment Rate	Pearson Correlation	.190	-.211	-.202	-.250	-.263	.414*	.018	1
	Sig. (2-tailed)	.363	.312	.334	.229	.204	.040	.966	
	N	25	25	25	25	25	25	8	25

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 81. The result of the correlation analysis between the dependent variable (Condition of driveway/sidewalk section) and social capital variable

		D / S_ condition	Social Mobility	Marriage Rate	Own Children 18	LN Ethnic Diversity	Homeownership Rate	Voter Turnout	Housing Price Inequality	Crime Incidence N2	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
Driveway and Sidewalk Condition	Pearson Correlation	1	-.131	-.226	.029	.116	-.297	-.306	.079	.015	.142	-.060	.000
	Sig. (2-tailed)		.490	.229	.879	.542	.112	.100	.677	.937	.456	.754	1.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
Social Mobility	Pearson Correlation	-.131	1	.430*	-.157	-.597**	.442*	.506**	-.594**	-.282	-.427*	-.289	-.328
	Sig. (2-tailed)	.490		.018	.407	.000	.015	.004	.001	.131	.019	.122	.076
	N	30	30	30	30	30	30	30	30	30	30	30	30
Marriage Rate	Pearson Correlation	-.226	.430*	1	.588**	-.196	.678**	.529**	-.073	.025	-.112	-.213	-.219
	Sig. (2-tailed)	.229	.018		.001	.300	.000	.003	.701	.895	.554	.259	.246
	N	30	30	30	30	30	30	30	30	30	30	30	30
Own Children 18	Pearson Correlation	.029	-.157	.588**	1	.350	.157	.014	.226	.206	.272	-.049	.005
	Sig. (2-tailed)	.879	.407	.001		.058	.406	.941	.230	.276	.146	.797	.978
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Ethnic Diversity	Pearson Correlation	.116	-.597**	-.196	.350	1	-.669**	-.735**	.448*	.480**	.580**	.242	.308
	Sig. (2-tailed)	.542	.000	.300	.058		.000	.000	.013	.007	.001	.197	.097
	N	30	30	30	30	30	30	30	30	30	30	30	30
Homeownership Rate	Pearson Correlation	-.297	.442*	.678**	.157	-.669**	1	.850**	-.251	-.233	-.368*	-.201	-.241
	Sig. (2-tailed)	.112	.015	.000	.406	.000		.000	.180	.215	.046	.287	.200
	N	30	30	30	30	30	30	30	30	30	30	30	30
Voter Turnout	Pearson Correlation	-.306	.506**	.529**	.014	-.735**	.850**	1	-.302	-.313	-.460*	-.202	-.234
	Sig. (2-tailed)	.100	.004	.003	.941	.000	.000		.105	.092	.011	.285	.213
	N	30	30	30	30	30	30	30	30	30	30	30	30
Housing Price Inequality	Pearson Correlation	.079	-.594**	-.073	.226	.448*	-.251	-.302	1	.410*	.410*	.346	.383*
	Sig. (2-tailed)	.677	.001	.701	.230	.013	.180	.105		.024	.025	.061	.036
	N	30	30	30	30	30	30	30	30	30	30	30	30
Crime Incidence N2	Pearson Correlation	.015	-.282	.025	.206	.480**	-.233	-.313	.410*	1	.930**	.681**	.743**
	Sig. (2-tailed)	.937	.131	.895	.276	.007	.215	.092	.024		.000	.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Incidence N3	Pearson Correlation	.142	-.427*	-.112	.272	.580**	-.368*	-.460*	.410*	.930**	1	.666**	.745**
	Sig. (2-tailed)	.456	.019	.554	.146	.001	.046	.011	.025	.000		.000	.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD1	Pearson Correlation	-.060	-.289	-.213	-.049	.242	-.201	-.202	.346	.681**	.666**	1	.984**
	Sig. (2-tailed)	.754	.122	.259	.797	.197	.287	.285	.061	.000	.000		.000
	N	30	30	30	30	30	30	30	30	30	30	30	30
LN Crime Loss & Damage LD2	Pearson Correlation	.000	-.328	-.219	.005	.308	-.241	-.234	.383*	.743**	.745**	.984**	1
	Sig. (2-tailed)	1.000	.076	.246	.978	.097	.200	.213	.036	.000	.000	.000	
	N	30	30	30	30	30	30	30	30	30	30	30	30

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Identifying influential social capital variables affecting the condition of dwelling structure and environment (Block-level analysis)

There are seven block group-level analyses to assess the impact of social capital on each dependent variable: total housing condition, structural housing condition, non-structural housing condition, housing exterior condition, garage condition, yard/fence condition, and driveway/sidewalk condition. Social capital's influence on housing condition (i.e., the condition of dwelling structure and environment) is identified. Structural housing condition and housing exterior condition are influenced by the level of social capital according to the results of the block group-level analyses.

In the block-level analysis, we also examine which variables among eleven social capital variables are influential in relation to each dependent variable. A correlation analysis and a multiple regression analysis are used to identify the influential variables. The geographical unit for the analyses in each data set is a Census block.

Influential social capital variables associated with total housing condition

There are eleven social capital variables measured at a block level: social mobility, marriage rate, family status for own children under 18 years old, ethnic diversity, homeownership rate, voter turnout, housing price inequality, crime incidence N1, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD2. Among these eleven social capital variables, which one is strongest as an influential variable regarding the total housing condition? Total housing condition is the overall condition of dwelling structure and environment which is represented by total composite score. A block with a high total composite score will likely have a poor condition of dwelling structure and environment for the block. And, a block with a low total composite score is expected to have a good condition. According to the results (Table 82) of the first correlation analysis, there are several influential social capital variables regarding the total housing condition. The variables, such as ‘marriage rate’ and ‘crime incidence N3’ (the average number of Part 1 and Part 2 offenses (all offenses) which occurred in a block normalized by the population of the block), are closely related to total housing condition based on the correlation coefficients (over 0.3). Correlation coefficients for marriage rate (-.359) and for crime incidence N3 (.312) are at a significance level of 5% for these two variables showing how strongly these two variables are related to total housing condition.

Table 82. The result of the correlation analysis
(Total housing condition and other independent variables)

		LN Total Housing Condition	LN Social Mobility	Marriage Rate	LN Own Children 18	LN Ethnic Diversity	LN Homeownership Rate	LN Voter Turnout	LN Housing Price Inequality	LN Crime Incidence N1	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
LN Total Housing Condition	Pearson Correlation	1	-.244**	-.359**	.248**	.211**	-.239**	-.228**	.162**	.260**	.312**	.067	.151*
	Sig. (2-tailed)		.000	.000	.000	.001	.000	.000	.004	.000	.000	.310	.013
	N	315	315	310	304	262	310	315	315	288	311	231	270
LN Social Mobility	Pearson Correlation	-.244**	1	.292**	-.254**	-.165**	.400**	.331**	-.207**	-.106	-.188**	-.054	-.144*
	Sig. (2-tailed)	.000		.000	.000	.007	.000	.000	.000	.071	.001	.408	.017
	N	315	317	312	306	264	312	317	317	290	313	233	272
Marriage Rate	Pearson Correlation	-.359**	.292**	1	-.359**	-.183**	.514**	.424**	-.202**	-.373**	-.367**	-.215**	-.252**
	Sig. (2-tailed)	.000	.000		.000	.003	.000	.000	.000	.000	.000	.001	.000
	N	310	312	312	305	261	309	312	312	286	308	230	268
LN Own Children 18	Pearson Correlation	.248**	-.254**	-.359**	1	.142*	-.196**	-.255**	.008	.170**	.144*	.096	.135*
	Sig. (2-tailed)	.000	.000	.000		.023	.001	.000	.887	.004	.012	.148	.029
	N	304	306	305	306	256	303	306	306	282	302	228	264
LN Ethnic Diversity	Pearson Correlation	.211**	-.165**	-.183**	.142*	1	-.261**	-.274**	.173**	.275**	.331**	.132	.175**
	Sig. (2-tailed)	.001	.007	.003	.023		.000	.000	.005	.000	.000	.062	.008
	N	262	264	261	256	264	260	264	264	244	261	200	229
LN Homeownership Rate	Pearson Correlation	-.239**	.400**	.514**	-.196**	-.261**	1	.553**	-.372**	-.323**	-.399**	-.040	-.156*
	Sig. (2-tailed)	.000	.000	.000	.001	.000		.000	.000	.000	.000	.544	.010
	N	310	312	309	303	260	312	312	312	285	308	229	267
LN Voter Turnout	Pearson Correlation	-.228**	.331**	.424**	-.255**	-.274**	.553**	1	-.175**	-.244**	-.273**	-.116	-.135*
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.002	.000	.000	.078	.026
	N	315	317	312	306	264	312	317	317	290	313	233	272
LN Housing Price Inequality	Pearson Correlation	.162**	-.207**	-.202**	.008	.173**	-.372**	-.175**	1	.427**	.468**	.192**	.253**
	Sig. (2-tailed)	.004	.000	.000	.887	.005	.000	.002		.000	.000	.003	.000
	N	315	317	312	306	264	312	317	317	290	313	233	272
LN Crime Incidence N1	Pearson Correlation	.260**	-.106	-.373**	.170**	.275**	-.323**	-.244**	.427**	1	.851**	.514**	.533**
	Sig. (2-tailed)	.000	.071	.000	.004	.000	.000	.000	.000		.000	.000	.000
	N	288	290	286	282	244	285	290	290	290	290	233	259
LN Crime Incidence N3	Pearson Correlation	.312**	-.188**	-.367**	.144*	.331**	-.399**	-.273**	.468**	.851**	1	.425**	.534**
	Sig. (2-tailed)	.000	.001	.000	.012	.000	.000	.000	.000	.000		.000	.000
	N	311	313	308	302	261	308	313	313	290	313	233	272
LN Crime Loss and Damage LD1	Pearson Correlation	.067	-.054	-.215**	.096	.132	-.040	-.116	.192**	.514**	.425**	1	.900**
	Sig. (2-tailed)	.310	.408	.001	.148	.062	.544	.078	.003	.000	.000		.000
	N	231	233	230	228	200	229	233	233	233	233	233	233
LN Crime Loss and Damage LD2	Pearson Correlation	.151*	-.144*	-.252**	.135*	.175**	-.156*	-.135*	.253**	.533**	.534**	.900**	1
	Sig. (2-tailed)	.013	.017	.000	.029	.008	.010	.026	.000	.000	.000	.000	
	N	270	272	268	264	229	267	272	272	259	272	233	272

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

In each block level analysis, we also conducted multiple regression analysis. Multiple regression analysis helps to measure contributions of each independent variable while holding other included variables constant. First, social capital variables exhibiting multicollinearity are not appropriate to be used together in multiple regression analysis. If some independent variables are closely related to each other, then they could have indeterminant influences on the housing condition. Thus, it was necessary to study the social capital variables likely exhibiting the effects of multicollinearity through correlation analysis (correlation coefficients among potential independent variables over 0.7). Then the identified variables exhibiting possible multicollinearity are combined to control multicollinearity using components analysis. The derived variables which are components are represented by rotated component scores. In the first block level analysis (dependent variable: total housing condition), crime incidence N1 and crime incidence N3 are closely correlated; and crime loss and damage LD1 and crime loss and damage LD2 also are closely correlated.

Table 83 below shows the results of Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity in the group of the four social capital variables (crime relevant variables) for components analysis.

In the group of the four social capital variables (crime incidence N1, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD2), the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is .583, which meets the minimum criteria (0.5). And, the significance value for the Bartlett's Test of Sphericity is less than .05, therefore, the null hypothesis is rejected: the four variables are uncorrelated. Thus, conducting components analysis is appropriate in the group of the four social capital variables.

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.583
Bartlett's Test of Sphericity	Approx. Chi-Square	801.534
	df	6
	Sig.	.000

Table 83. KMO and Bartlett's test in the components analysis for the four social capital variables (crime incidence, and crime loss and damage)

In the components analysis, two components are obtained from the group of the four social capital variables (crime incidence N1, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD2). The following tables (Table 84 and Table 85) show the results of the components analysis.

COMPONENT	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.867	71.685	71.685	2.867	71.685	71.685	1.901	47.513	47.513
2	.901	22.526	94.211	.901	22.526	94.211	1.868	46.697	94.211
3	.155	3.886	98.096						
4	.076	1.904	100.000						

Extraction Method: Principal Component Analysis.

Table 84. Proportion of variance summarized in the components analysis for the four social capital variables (crime incidence, and crime loss and damage)

Table 84 shows the two components extracted from the components analysis along with their Eigenvalues, the percent of variance attributable to each component, and the cumulative variance of the component and the previous component. The first rotated component explains 47.513% of total variance, and the second rotated component accounts for 46.697% of total variance.

	Component	
	1	2
LN Crime Loss and Damage LD1	.948	.235
LN Crime Loss and Damage LD2	.928	.294
LN Crime Incidence N3	.228	.941
LN Crime Incidence N1	.297	.917

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
Rotation converged in 3 iterations.

Table 85. Varimax Rotated Component Matrix for the four social capital variables (crime incidence, and crime loss and damage)

Table 85 above shows the loadings of the four social capital variables on the two components extracted. The higher the absolute value of the loading, the more the variable contributes to the components. The variables with loadings that are less than 0.5 are regarded as lesser contributing variables. Crime loss and damage LD1 (Part 1 offenses) and crime loss and damage LD2 (all types of offenses) are substantially loaded on Component 1. While crime incidence N1 (Part 1 offenses) and crime incidence N3 (all types of offenses) are substantially loaded on Component 2. These two components represented by rotated component scores will be used as independent variables for all multiple regression analyses in each block level analysis.

Dependent variable: total housing condition

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	2.417		.000	
LN Social Mobility*	-.262	-.128	.071	1.248
Marriage Rate**	-.547	-.212	.010	1.670
LN Own Children Under 18 Years Old	.098	.091	.181	1.161
LN Ethnic Diversity	.033	.057	.408	1.187
LN Homeownership Rate**	.157	.242	.008	2.053
LN Voter Turnout	-.156	-.106	.191	1.634
LN Housing Price Inequality	.084	.098	.183	1.351
Component_1_Crime Loss and Damage	-.028	-.063	.325	1.039
Component_2_Crime Incidence**	.154	.329	.000	1.520

R^2 = 0.282, adjusted R^2 = 0.246, F-ratio = 7.901, n = 318.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 86. The result of the multiple regression analysis in the first block-level analysis

In a multiple regression analysis, standardized regression coefficients help to show how much a dependent variable is expected to increase or decrease in Z-score in standard deviation units when an independent variable increases by one standard deviation unit while controlling all the other variables. According to Table 86, four social capital variables (social mobility, marriage rate, homeownership rate, and crime incidence) have a statistically significant impact on total housing condition at a 5% significance level. According to the standardized regression coefficients, the most influential variable regarding total housing condition is crime incidence (Beta=.329). The second most influential variable is homeownership rate (Beta=.242). The third most influential variable is marriage rate (Beta=-.212). And, the least influential variable regarding total housing condition is social mobility (Beta=-.128). Based on the Standardized Coefficients (Beta) of the variable of crime incidence, one standard deviation change in the variable of crime incidence is associated with 0.329 standard deviation change in the dependent variable (total housing condition) while controlling all the other social capital variables.

Influential social capital variables associated with structural housing condition

Among the eleven social capital variables, which variables are most related to the structural housing condition? The structural housing condition is described by the condition of two sections: housing exterior section and garage section. The interim composite score for the structural housing condition is used in a correlation analysis to examine the relationships. The results (Table 87) of the correlation analysis show that four social capital variables (i.e., marriage rate, housing price inequality, crime incidence N1, and crime incidence N3) are influential in relation to the structural housing condition at a 5% significance level. Marriage rate (r=-.340), housing price inequality (r=.337), crime incidence N1(r=.442), and crime incidence N3(r=.472) are the social capital variables most closely related to the structural housing condition at a 5% significance level.

Table 87. The result of the correlation analysis
(Structural housing condition and other independent variables)

		LN Structural Housing Condition	LN Social Mobility	Marriage Rate	LN Own Children 18	LN Ethnic Diversity	LN Homeownership Rate	LN Voter Turnout	LN Housing Price Inequality	LN Crime Incidence N1	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
LN Structural Housing Condition	Pearson Correlation	1	-.259**	-.340**	.194**	.167*	-.230**	-.211**	.337**	.442**	.472**	.174*	.248**
	Sig. (2-tailed)		.000	.000	.001	.010	.000	.000	.000	.000	.000	.010	.000
	N	280	280	279	276	237	277	280	280	259	277	217	246
LN Social Mobility	Pearson Correlation	-.259**	1	.292**	-.254**	-.165**	.400**	.331**	-.207**	-.106	-.188**	-.054	-.144*
	Sig. (2-tailed)	.000		.000	.000	.007	.000	.000	.000	.071	.001	.408	.017
	N	280	317	312	306	264	312	317	317	290	313	233	272
Marriage Rate	Pearson Correlation	-.340**	.292**	1	-.359**	-.183**	.514**	.424**	-.202**	-.373**	-.367**	-.215**	-.252**
	Sig. (2-tailed)	.000	.000		.000	.003	.000	.000	.000	.000	.000	.001	.000
	N	279	312	312	305	261	309	312	312	286	308	230	268
LN Own Children 18	Pearson Correlation	.194**	-.254**	-.359**	1	.142*	-.196**	-.255**	.008	.170**	.144*	.096	.135*
	Sig. (2-tailed)	.001	.000	.000		.023	.001	.000	.887	.004	.012	.148	.029
	N	276	306	305	306	256	303	306	306	282	302	228	264
LN Ethnic Diversity	Pearson Correlation	.167*	-.165**	-.183**	.142*	1	-.261**	-.274**	.173**	.275**	.331**	.132	.175**
	Sig. (2-tailed)	.010	.007	.003	.023		.000	.000	.005	.000	.000	.062	.008
	N	237	264	261	256	264	260	264	264	244	261	200	229
LN Homeownership Rate	Pearson Correlation	-.230**	.400**	.514**	-.196**	-.261**	1	.553**	-.372**	-.323**	-.399**	-.040	-.156*
	Sig. (2-tailed)	.000	.000	.000	.001	.000		.000	.000	.000	.000	.544	.010
	N	277	312	309	303	260	312	312	312	285	308	229	267
LN Voter Turnout	Pearson Correlation	-.211**	.331**	.424**	-.255**	-.274**	.553**	1	-.175**	-.244**	-.273**	-.116	-.135*
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.002	.000	.000	.078	.026
	N	280	317	312	306	264	312	317	317	290	313	233	272
LN Housing Price Inequality	Pearson Correlation	.337**	-.207**	-.202**	.008	.173**	-.372**	-.175**	1	.427**	.468**	.192**	.253**
	Sig. (2-tailed)	.000	.000	.000	.887	.005	.000	.002		.000	.000	.003	.000
	N	280	317	312	306	264	312	317	317	290	313	233	272
LN Crime Incidence N1	Pearson Correlation	.442**	-.106	-.373**	.170**	.275**	-.323**	-.244**	.427**	1	.851**	.514**	.533**
	Sig. (2-tailed)	.000	.071	.000	.004	.000	.000	.000	.000		.000	.000	.000
	N	259	290	286	282	244	285	290	290	290	290	233	259
LN Crime Incidence N3	Pearson Correlation	.472**	-.188**	-.367**	.144*	.331**	-.399**	-.273**	.468**	.851**	1	.425**	.534**
	Sig. (2-tailed)	.000	.001	.000	.012	.000	.000	.000	.000	.000		.000	.000
	N	277	313	308	302	261	308	313	313	290	313	233	272
LN Crime Loss and Damage LD1	Pearson Correlation	.174*	-.054	-.215**	.096	.132	-.040	-.116	.192**	.514**	.425**	1	.900**
	Sig. (2-tailed)	.010	.408	.001	.148	.062	.544	.078	.003	.000	.000		.000
	N	217	233	230	228	200	229	233	233	233	233	233	233
LN Crime Loss and Damage LD2	Pearson Correlation	.248**	-.144*	-.252**	.135*	.175**	-.156*	-.135*	.253**	.533**	.534**	.900**	1
	Sig. (2-tailed)	.000	.017	.000	.029	.008	.010	.026	.000	.000	.000	.000	
	N	246	272	268	264	229	267	272	272	259	272	233	272

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Especially, the correlation coefficient of the variable of ‘marriage rate’ (-.340) shows that the variable of marriage rate is negatively associated with structural housing condition. A block with high marriage rate has a smaller interim composite score for structural housing condition, which means structural housing condition is better.

The social capital variables exhibiting the effects of multicollinearity through correlation analysis were determined. Likewise the first block level analysis, crime incidence N1 and crime incidence N3 are closely correlated, and crime loss and damage LD1 and crime loss and damage LD2 also are closely correlated. The identified variables exhibiting multicollinearity are combined to control multicollinearity for a multiple regression analysis using components analysis. The two components obtained from the former components analysis are used in a multiple regression analysis for the second block level analysis.

According to Table 88, four social capital variables (social mobility, marriage rate, homeownership rate, and crime incidence) have a statistically significant impact on structural housing condition at a significance level (0.05 and 0.1). According to the standardized regression coefficients, the most influential variable regarding structural housing condition is crime incidence (Beta=.390). The second most influential variable is social mobility (Beta=-.199). The third most influential variable is homeownership rate (Beta=.172). And, the least influential variable regarding structural housing condition is marriage rate (Beta=-.163). Based on the Standardized Coefficients (Beta) of the variable of crime incidence, one standard deviation change in the variable of crime incidence is associated with 0.390 standard deviation change in the dependent variable (structural housing condition) while controlling all the other social capital variables.

Dependent variable: structural housing condition

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	3.027		.001	
LN Social Mobility**	-.859	-.199	.006	1.252
Marriage Rate**	-.913	-.163	.046	1.587
LN Own Children Under 18 Years Old	.132	.056	.415	1.122
LN Ethnic Diversity	.037	.030	.665	1.186
LN Homeownership Rate*	.235	.172	.061	2.020
LN Voter Turnout	-.017	-.005	.948	1.587
LN Housing Price Inequality	.169	.093	.208	1.319
Component_1_Crime Loss and Damage	-.009	-.009	.888	1.051
Component_2_Crime Incidence**	.390	.390	.000	1.480

R^2 = 0.290, adjusted R^2 = 0.253, F-ratio = 7.794, n = 318.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 88. The result of the multiple regression analysis in the second block-level analysis

Influential social capital variables associated with non-structural housing condition

The non-structural housing condition is summarized by the conditions of the following sections: the yard/fence section and the driveway/sidewalk section. The results (Table 89) of the correlation analysis show that there is no statistically significant influential variable for the non-structural housing condition. All variables' correlation coefficients are less than 0.3 which is minimum level.

However, the variable of marriage rate is found somewhat weakly related to the non-structural housing condition. The correlation coefficient of the variable is less than 0.3. Thus, it is inferred that its relationship with the non-structural housing condition seems to be weak.

Previously, from the results of the block group-level analysis (dependent variable: non-structural housing condition), it is identified that social capital does not have an impact on the non-structural housing condition. Likewise, the block-level correlation analysis also shows that there is no social capital variable closely associated with the non-structural housing condition.

Table 89. The result of the correlation analysis
(Non-structural housing condition and other independent variables)

		LN Nonstructural Housing Condition	LN Social Mobility	Marriage Rate	LN Own Children 18	LN Ethnic Diversity	LN Homeownership Rate	LN Voter Turnout	LN Housing Price Inequality	LN Crime Incidence N1	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
LN Nonstructural Housing Condition	Pearson Correlation	1	-.142*	-.236**	.162**	.163**	-.118*	-.161**	.074	.149*	.188**	.061	.072
	Sig. (2-tailed)		.012	.000	.005	.008	.037	.004	.191	.011	.001	.355	.238
	N	315	315	310	304	262	310	315	315	288	311	231	270
LN Social Mobility	Pearson Correlation	-.142*	1	.292**	-.254**	-.165**	.400**	.331**	-.207**	-.106	-.188**	-.054	-.144*
	Sig. (2-tailed)	.012		.000	.000	.007	.000	.000	.000	.071	.001	.408	.017
	N	315	317	312	306	264	312	317	317	290	313	233	272
Marriage Rate	Pearson Correlation	-.236**	.292**	1	-.359**	-.183**	.514**	.424**	-.202**	-.373**	-.367**	-.215**	-.252**
	Sig. (2-tailed)	.000	.000		.000	.003	.000	.000	.000	.000	.000	.001	.000
	N	310	312	312	305	261	309	312	312	286	308	230	268
LN Own Children 18	Pearson Correlation	.162**	-.254**	-.359**	1	.142*	-.196**	-.255**	.008	.170**	.144*	.096	.135*
	Sig. (2-tailed)	.005	.000	.000		.023	.001	.000	.887	.004	.012	.148	.029
	N	304	306	305	306	256	303	306	306	282	302	228	264
LN Ethnic Diversity	Pearson Correlation	.163**	-.165**	-.183**	.142*	1	-.261**	-.274**	.173**	.275**	.331**	.132	.175**
	Sig. (2-tailed)	.008	.007	.003	.023		.000	.000	.005	.000	.000	.062	.008
	N	262	264	261	256	264	260	264	264	244	261	200	229
LN Homeownership Rate	Pearson Correlation	-.118*	.400**	.514**	-.196**	-.261**	1	.553**	-.372**	-.323**	-.399**	-.040	-.156*
	Sig. (2-tailed)	.037	.000	.000	.001	.000		.000	.000	.000	.000	.544	.010
	N	310	312	309	303	260	312	312	312	285	308	229	267
LN Voter Turnout	Pearson Correlation	-.161**	.331**	.424**	-.255**	-.274**	.553**	1	-.175**	-.244**	-.273**	-.116	-.135*
	Sig. (2-tailed)	.004	.000	.000	.000	.000	.000		.002	.000	.000	.078	.026
	N	315	317	312	306	264	312	317	317	290	313	233	272
LN Housing Price Inequality	Pearson Correlation	.074	-.207**	-.202**	.008	.173**	-.372**	-.175**	1	.427**	.468**	.192**	.253**
	Sig. (2-tailed)	.191	.000	.000	.887	.005	.000	.002		.000	.000	.003	.000
	N	315	317	312	306	264	312	317	317	290	313	233	272
LN Crime Incidence N1	Pearson Correlation	.149*	-.106	-.373**	.170**	.275**	-.323**	-.244**	.427**	1	.851**	.514**	.533**
	Sig. (2-tailed)	.011	.071	.000	.004	.000	.000	.000	.000		.000	.000	.000
	N	288	290	286	282	244	285	290	290	290	290	233	259
LN Crime Incidence N3	Pearson Correlation	.188**	-.188**	-.367**	.144*	.331**	-.399**	-.273**	.468**	.851**	1	.425**	.534**
	Sig. (2-tailed)	.001	.001	.000	.012	.000	.000	.000	.000	.000		.000	.000
	N	311	313	308	302	261	308	313	313	290	313	233	272
LN Crime Loss and Damage LD1	Pearson Correlation	.061	-.054	-.215**	.096	.132	-.040	-.116	.192**	.514**	.425**	1	.900**
	Sig. (2-tailed)	.355	.408	.001	.148	.062	.544	.078	.003	.000	.000		.000
	N	231	233	230	228	200	229	233	233	233	233	233	233
LN Crime Loss and Damage LD2	Pearson Correlation	.072	-.144*	-.252**	.135*	.175**	-.156*	-.135*	.253**	.533**	.534**	.900**	1
	Sig. (2-tailed)	.238	.017	.000	.029	.008	.010	.026	.000	.000	.000	.000	
	N	270	272	268	264	229	267	272	272	259	272	233	272

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Dependent variable: non-structural housing condition

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	1.433		.002	
LN Social Mobility	-.088	-.046	.552	1.248
Marriage Rate**	-.440	-.182	.042	1.670
LN Own Children Under 18 Years Old	.030	.030	.688	1.161
LN Ethnic Diversity	.024	.044	.556	1.187
LN Homeownership Rate**	.150	.247	.013	2.053
LN Voter Turnout	-.184	-.133	.133	1.634
LN Housing Price Inequality	.053	.065	.417	1.351
Component_1_Crime Loss and Damage	-.021	-.051	.473	1.039
Component_2_Crime Incidence**	.099	.226	.009	1.520

R^2 = 0.138, adjusted R^2 = 0.095, F-ratio = 3.219, n = 318.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 90. The result of the multiple regression analysis in the third block-level analysis

It can be seen that crime incidence N1 and crime incidence N3 are closely correlated, and crime loss-damage LD1 and crime loss-damage LD2 also are closely related to each other, based on correlation coefficients (over 0.7). In order to control the effect of multicollinearity, the identified variables exhibiting multicollinearity are combined by using components analysis. The derived variables (components) represented by rotated component scores are used in a multiple regression analysis to measure contributions of each social capital variable from the multiple regression function. The two components obtained from the former components analysis are used in a multiple regression analysis for the third block level analysis.

According to Table 90, three social capital variables (marriage rate, homeownership rate, and crime incidence) have a statistically significant influence on the non-structural housing condition at a 5% significance level. The most influential variable regarding non-structural housing condition is homeownership rate (Beta=.247). The second most influential variable is crime incidence (Beta=.226). And the least influential variable regarding non-structural housing condition is marriage rate (Beta=-.182). Based on the Standardized Coefficients (Beta) of the variable of homeownership rate, one standard deviation change in the variable of homeownership rate is associated with 0.247 standard deviation change in the dependent variable (non-structural housing condition) while controlling all the other social capital variables.

Influential social capital variables associated with the condition of housing exterior section

One of the structural parts of a house is the housing exterior. According to the results (Table 91) of the correlation analysis, four social capital variables including marriage rate, housing price inequality, crime incidence N1, and crime incidence N3, are influential regarding the condition of housing exterior section at a 5% significance level. The correlation coefficients of the four social capital variables are as follows: marriage rate (-.315), housing price inequality (.329), crime incidence N1(.462), and crime incidence N3 (.471). According to the correlation coefficients, the variable of crime incidence is closely associated with the condition of housing exterior section.

Other social capital variables also are connected to the condition of housing exterior section. However, correlation coefficients of the other variables are less than 0.3. It is inferred that these variables' relationships with the condition of housing exterior section are weak when compared to the four social capital variables relationships with the dependent variable.

According to the correlation coefficients, crime incidence N1 and crime incidence N3 are closely related to each other, and crime loss-damage LD1 and crime loss-damage LD2 also are correlated. The correlation coefficients of these four social capital variables are over 0.7. One can expect that these variables have the effects of multicollinearity which leads to mathematical indeterminacy in regression analysis, so that it is appropriate to combine the four social capital variables to control the effects of multicollinearity by using components analysis. The derived variables (components) represented by rotated component scores are obtained from the former components analysis. The two components are used in a multiple regression analysis for the fourth block level analysis.

According to Table 92, two social capital variables (social mobility and crime incidence) have a statistically significant impact on the condition of housing exterior section at a 10% significance level. The most influential variable regarding the condition of housing exterior section is crime incidence (Beta=.320).

Table 91. The result of the correlation analysis
(the condition of housing exterior section and other independent variables)

		LN Housing Exterior Condition	LN Social Mobility	Marriage Rate	LN Own Children 18	LN Ethnic Diversity	LN Homeownership Rate	LN Voter Turnout	LN Housing Price Inequality	LN Crime Incidence N1	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
LN Housing Exterior Condition	Pearson Correlation	1	$-.233^{**}$	$-.315^{**}$	.113	$.244^{**}$	$-.269^{**}$	$-.242^{**}$	$.329^{**}$	$.462^{**}$	$.471^{**}$	$.166^{*}$	$.280^{**}$
	Sig. (2-tailed)		.000	.000	.072	.000	.000	.000	.000	.000	.000	.017	.000
	N	259	259	258	255	220	256	259	259	241	256	207	231
LN Social Mobility	Pearson Correlation	$-.233^{**}$	1	$.292^{**}$	$-.254^{**}$	$-.165^{**}$	$.400^{**}$	$.331^{**}$	$-.207^{**}$	-.106	$-.188^{**}$	-.054	$-.144^{*}$
	Sig. (2-tailed)	.000		.000	.000	.007	.000	.000	.000	.071	.001	.408	.017
	N	259	317	312	306	264	312	317	317	290	313	233	272
Marriage Rate	Pearson Correlation	$-.315^{**}$	$.292^{**}$	1	$-.359^{**}$	$-.183^{**}$	$.514^{**}$	$.424^{**}$	$-.202^{**}$	$-.373^{**}$	$-.367^{**}$	$-.215^{**}$	$-.252^{**}$
	Sig. (2-tailed)	.000	.000		.000	.003	.000	.000	.000	.000	.000	.001	.000
	N	258	312	312	305	261	309	312	312	286	308	230	268
LN Own Children 18	Pearson Correlation	.113	$-.254^{**}$	$-.359^{**}$	1	$.142^{*}$	$-.196^{**}$	$-.255^{**}$	.008	$.170^{**}$	$.144^{*}$	.096	$.135^{*}$
	Sig. (2-tailed)	.072	.000	.000		.023	.001	.000	.887	.004	.012	.148	.029
	N	255	306	305	306	256	303	306	306	282	302	228	264
LN Ethnic Diversity	Pearson Correlation	$.244^{**}$	$-.165^{**}$	$-.183^{**}$	$.142^{*}$	1	$-.261^{**}$	$-.274^{**}$	$.173^{**}$	$.275^{**}$	$.331^{**}$	.132	$.175^{**}$
	Sig. (2-tailed)	.000	.007	.003	.023		.000	.000	.005	.000	.000	.062	.008
	N	220	264	261	256	264	260	264	264	244	261	200	229
LN Homeownership Rate	Pearson Correlation	$-.269^{**}$	$.400^{**}$	$.514^{**}$	$-.196^{**}$	$-.261^{**}$	1	$.553^{**}$	$-.372^{**}$	$-.323^{**}$	$-.399^{**}$	-.040	$-.156^{*}$
	Sig. (2-tailed)	.000	.000	.000	.001	.000		.000	.000	.000	.000	.544	.010
	N	256	312	309	303	260	312	312	312	285	308	229	267
LN Voter Turnout	Pearson Correlation	$-.242^{**}$	$.331^{**}$	$.424^{**}$	$-.255^{**}$	$-.274^{**}$	$.553^{**}$	1	$-.175^{**}$	$-.244^{**}$	$-.273^{**}$	-.116	$-.135^{*}$
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000		.002	.000	.000	.078	.026
	N	259	317	312	306	264	312	317	317	290	313	233	272
LN Housing Price Inequality	Pearson Correlation	$.329^{**}$	$-.207^{**}$	$-.202^{**}$	.008	$.173^{**}$	$-.372^{**}$	$-.175^{**}$	1	$.427^{**}$	$.468^{**}$	$.192^{**}$	$.253^{**}$
	Sig. (2-tailed)	.000	.000	.000	.887	.005	.000	.002		.000	.000	.003	.000
	N	259	317	312	306	264	312	317	317	290	313	233	272
LN Crime Incidence N1	Pearson Correlation	$.462^{**}$	-.106	$-.373^{**}$	$.170^{**}$	$.275^{**}$	$-.323^{**}$	$-.244^{**}$	$.427^{**}$	1	$.851^{**}$	$.514^{**}$	$.533^{**}$
	Sig. (2-tailed)	.000	.071	.000	.004	.000	.000	.000	.000		.000	.000	.000
	N	241	290	286	282	244	285	290	290	290	290	233	259
LN Crime Incidence N3	Pearson Correlation	$.471^{**}$	$-.188^{**}$	$-.367^{**}$	$.144^{*}$	$.331^{**}$	$-.399^{**}$	$-.273^{**}$	$.468^{**}$	$.851^{**}$	1	$.425^{**}$	$.534^{**}$
	Sig. (2-tailed)	.000	.001	.000	.012	.000	.000	.000	.000	.000		.000	.000
	N	256	313	308	302	261	308	313	313	290	313	233	272
LN Crime Loss and Damage LD1	Pearson Correlation	$.166^{*}$	-.054	$-.215^{**}$	.096	.132	-.040	-.116	$.192^{**}$	$.514^{**}$	$.425^{**}$	1	$.900^{**}$
	Sig. (2-tailed)	.017	.408	.001	.148	.062	.544	.078	.003	.000	.000		.000
	N	207	233	230	228	200	229	233	233	233	233	233	233
LN Crime Loss and Damage LD2	Pearson Correlation	$.280^{**}$	$-.144^{*}$	$-.252^{**}$	$.135^{*}$	$.175^{**}$	$-.156^{*}$	$-.135^{*}$	$.253^{**}$	$.533^{**}$	$.534^{**}$	$.900^{**}$	1
	Sig. (2-tailed)	.000	.017	.000	.029	.008	.010	.026	.000	.000	.000	.000	
	N	231	272	268	264	229	267	272	272	259	272	233	272

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Dependent variable: the condition of housing exterior section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	2.127		.041	
LN Social Mobility*	-.661	-.149	.052	1.294
Marriage Rate	-.752	-.132	.125	1.632
LN Own Children Under 18 Years Old	.003	.001	.987	1.132
LN Ethnic Diversity	.147	.120	.103	1.188
LN Homeownership Rate	.179	.128	.204	2.239
LN Voter Turnout	-.271	-.086	.322	1.654
LN Housing Price Inequality	.188	.098	.207	1.336
Component_1_Crime Loss and Damage	-.012	-.013	.853	1.058
Component_2_Crime Incidence**	.326	.320	.000	1.468

R^2 = 0.268, adjusted R^2 = 0.228, F-ratio = 6.643, n = 318.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 92. The result of the multiple regression analysis in the fourth block-level analysis

The second most influential variable regarding the condition of housing exterior section is social mobility (Beta=-.149). Based on the Standardized Coefficients (Beta) of the variable of crime incidence, one standard deviation change in the variable of crime incidence is associated with 0.320 standard deviation change in the dependent variable (the condition of housing exterior section) while controlling all the other social capital variables.

Influential social capital variables associated with the condition of garage section

The results (Table 93) of the correlation analysis show that there is no appropriate variable related to the condition of garage section. As mentioned earlier, the correlation coefficient between two variables should be over 0.3 at least. Otherwise, it is difficult to assert that they are related to each other based on the correlation coefficients.

In the case of non-structural housing condition, most of social capital variables' correlation coefficients are less than 0.2. They are weakly associated with the condition of garage section. From the results of block group-level statistical analysis (i.e., correlation analysis and multiple regression analysis), it is found that social capital does not have a statistically significant impact on the condition of garage section. Likewise, the block-level correlation analysis also shows that there is no valid variable associated with the condition of garage section.

Next identified were the social capital variables exhibiting the effects of multicollinearity through correlation analysis (correlation coefficient among potential independent variables over 0.7). Based on correlation coefficients, crime incidence N1 and crime incidence N3 are closely correlated, and crime loss-damage LD1 and crime loss-damage LD2 also are closely correlated. The identified variables exhibiting multicollinearity are combined to control multicollinearity for a multiple regression analysis using components analysis. The two components obtained from the former components analysis are used in a multiple regression analysis for the fifth block level analysis.

Table 93. The result of the correlation analysis
(the condition of garage section and other independent variables)

		LN Garage Condition	LN Social Mobility	Marriage Rate	LN Own Children 18	LN Ethnic Diversity	LN Homeownership Rate	LN Voter Turnout	LN Housing Price Inequality	LN Crime Incidence N1	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
LN Garage Condition	Pearson Correlation	1	-.152*	-.175*	.164*	.092	-.028	-.119	.167*	.182*	.160*	.085	.077
	Sig. (2-tailed)		.027	.011	.017	.219	.689	.083	.015	.010	.020	.279	.294
	N	212	212	211	209	182	210	212	212	199	210	164	188
LN Social Mobility	Pearson Correlation	-.152*	1	.292**	-.254**	-.165**	.400**	.331**	-.207**	-.106	-.188**	-.054	-.144*
	Sig. (2-tailed)	.027		.000	.000	.007	.000	.000	.000	.071	.001	.408	.017
	N	212	317	312	306	264	312	317	317	290	313	233	272
Marriage Rate	Pearson Correlation	-.175*	.292**	1	-.359**	-.183**	.514**	.424**	-.202**	-.373**	-.367**	-.215**	-.252**
	Sig. (2-tailed)	.011	.000		.000	.003	.000	.000	.000	.000	.000	.001	.000
	N	211	312	312	305	261	309	312	312	286	308	230	268
LN Own Children 18	Pearson Correlation	.164*	-.254**	-.359**	1	.142*	-.196**	-.255**	.008	.170**	.144*	.096	.135*
	Sig. (2-tailed)	.017	.000	.000		.023	.001	.000	.887	.004	.012	.148	.029
	N	209	306	305	306	256	303	306	306	282	302	228	264
LN Ethnic Diversity	Pearson Correlation	.092	-.165**	-.183**	.142*	1	-.261**	-.274**	.173**	.275**	.331**	.132	.175**
	Sig. (2-tailed)	.219	.007	.003	.023		.000	.000	.005	.000	.000	.062	.008
	N	182	264	261	256	264	260	264	264	244	261	200	229
LN Homeownership Rate	Pearson Correlation	-.028	.400**	.514**	-.196**	-.261**	1	.553**	-.372**	-.323**	-.399**	-.040	-.156*
	Sig. (2-tailed)	.689	.000	.000	.001	.000		.000	.000	.000	.000	.544	.010
	N	210	312	309	303	260	312	312	312	285	308	229	267
LN Voter Turnout	Pearson Correlation	-.119	.331**	.424**	-.255**	-.274**	.553**	1	-.175**	-.244**	-.273**	-.116	-.135*
	Sig. (2-tailed)	.083	.000	.000	.000	.000	.000		.002	.000	.000	.078	.026
	N	212	317	312	306	264	312	317	317	290	313	233	272
LN Housing Price Inequality	Pearson Correlation	.167*	-.207**	-.202**	.008	.173**	-.372**	-.175**	1	.427**	.468**	.192**	.253**
	Sig. (2-tailed)	.015	.000	.000	.887	.005	.000	.002		.000	.000	.003	.000
	N	212	317	312	306	264	312	317	317	290	313	233	272
LN Crime Incidence N1	Pearson Correlation	.182*	-.106	-.373**	.170**	.275**	-.323**	-.244**	.427**	1	.851**	.514**	.533**
	Sig. (2-tailed)	.010	.071	.000	.004	.000	.000	.000	.000		.000	.000	.000
	N	199	290	286	282	244	285	290	290	290	290	233	259
LN Crime Incidence N3	Pearson Correlation	.160*	-.188**	-.367**	.144*	.331**	-.399**	-.273**	.468**	.851**	1	.425**	.534**
	Sig. (2-tailed)	.020	.001	.000	.012	.000	.000	.000	.000	.000		.000	.000
	N	210	313	308	302	261	308	313	313	290	313	233	272
LN Crime Loss and Damage LD1	Pearson Correlation	.085	-.054	-.215**	.096	.132	-.040	-.116	.192**	.514**	.425**	1	.900**
	Sig. (2-tailed)	.279	.408	.001	.148	.062	.544	.078	.003	.000	.000		.000
	N	164	233	230	228	200	229	233	233	233	233	233	233
LN Crime Loss and Damage LD2	Pearson Correlation	.077	-.144*	-.252**	.135*	.175**	-.156*	-.135*	.253**	.533**	.534**	.900**	1
	Sig. (2-tailed)	.294	.017	.000	.029	.008	.010	.026	.000	.000	.000	.000	
	N	188	272	268	264	229	267	272	272	259	272	233	272

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Dependent variable: the condition of garage section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	.931		.276	
LN Social Mobility*	-.517	-.159	.077	1.248
Marriage Rate	-.563	-.134	.188	1.606
LN Own Children Under 18 Years Old*	.320	.171	.052	1.190
LN Ethnic Diversity	.004	.005	.953	1.141
LN Homeownership Rate**	.280	.246	.023	1.783
LN Voter Turnout	-.072	-.032	.755	1.647
LN Housing Price Inequality	.151	.108	.230	1.258
Component_1_Crime Loss and Damage	.000	.000	.996	1.103
Component_2_Crime Incidence*	.150	.195	.051	1.533

R^2 = 0.166, adjusted R^2 = 0.108, F-ratio = 2.889, n = 318.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 94. The result of the multiple regression analysis in the fifth block-level analysis

According to Table 94, four social capital variables (social mobility, own children under 18 years old, homeownership rate, and crime incidence) have a statistically significant impact on the garage condition at a 10% significance level. According to the standardized regression coefficients, the most influential variable regarding the condition of garage section is homeownership rate (Beta=.246). The second most influential variable is crime incidence (Beta=.195). The third most influential variable is own children under 18 years old (Beta=.171). And the least influential variable regarding garage condition is social mobility (Beta=-.159). The standardized regression coefficients show how much a dependent variable is expected to increase or decrease in Z-score on standard deviation units when an independent variable increases by one standard deviation unit while controlling for all the other variables.

Influential social capital variables affecting the condition of yard and fence section

In the section of yard and fence, the results (Table 95) of the correlation analysis show that there is no influential social capital variable in terms of the condition of yard and fence section. Some variables, such as marriage rate and crime incidence, have a slightly higher correlation coefficients which are over 0.2 and less than 0.3. The correlation coefficients of most social capital variables, except for these two variables, are less than 0.2, which means that they are weakly associated with the condition of yard and fence section.

The results of the block group-level statistical analysis show that social capital variables do not influence the condition of yard and fence section. Likewise, the block-level of correlation analysis also shows that there is no influential variable associated with the condition of yard and fence section at an acceptable significance level.

Likewise, crime incidence N1 and crime incidence N3 are closely correlated, and crime loss-damage LD1 and crime loss-damage LD2 also are correlated. Thus, these social capital variables are combined to control the effects of multicollinearity by using components analysis. The derived variables (components) represented by rotated component scores are used in a multiple regression analysis. The two components obtained from the former components analysis (Table 83, Table 84, and Table 85) are used in a multiple regression analysis to find contributions of independent variables including the two components.

Table 95. The result of the correlation analysis
(the condition of yard and fence section and other independent variables)

		LN Yard/Fence Condition	LN Social Mobility	Marriage Rate	LN Own Children 18	LN Ethnic Diversity	LN Homeownership Rate	LN Voter Turnout	LN Housing Price Inequality	LN Crime Incidence N1	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
LN Yard/Fence Condition	Pearson Correlation	1	-.132*	-.231**	.140*	.153*	-.118*	-.193**	.111*	.183**	.252**	.086	.083
	Sig. (2-tailed)		.019	.000	.014	.013	.038	.001	.049	.002	.000	.195	.175
	N	314	314	310	304	262	310	314	314	287	310	230	269
LN Social Mobility	Pearson Correlation	-.132*	1	.292**	-.254**	-.165**	.400**	.331**	-.207**	-.106	-.188**	-.054	-.144*
	Sig. (2-tailed)	.019		.000	.000	.007	.000	.000	.000	.071	.001	.408	.017
	N	314	317	312	306	264	312	317	317	290	313	233	272
Marriage Rate	Pearson Correlation	-.231**	.292**	1	-.359**	-.183**	.514**	.424**	-.202**	-.373**	-.367**	-.215**	-.252**
	Sig. (2-tailed)	.000	.000		.000	.003	.000	.000	.000	.000	.000	.001	.000
	N	310	312	312	305	261	309	312	312	286	308	230	268
LN Own Children 18	Pearson Correlation	.140*	-.254**	-.359**	1	.142*	-.196**	-.255**	.008	.170**	.144*	.096	.135*
	Sig. (2-tailed)	.014	.000	.000		.023	.001	.000	.887	.004	.012	.148	.029
	N	304	306	305	306	256	303	306	306	282	302	228	264
LN Ethnic Diversity	Pearson Correlation	.153*	-.165**	-.183**	.142*	1	-.261**	-.274**	.173**	.275**	.331**	.132	.175**
	Sig. (2-tailed)	.013	.007	.003	.023		.000	.000	.005	.000	.000	.062	.008
	N	262	264	261	256	264	260	264	264	244	261	200	229
LN Homeownership Rate	Pearson Correlation	-.118*	.400**	.514**	-.196**	-.261**	1	.553**	-.372**	-.323**	-.399**	-.040	-.156*
	Sig. (2-tailed)	.038	.000	.000	.001	.000		.000	.000	.000	.000	.544	.010
	N	310	312	309	303	260	312	312	312	285	308	229	267
LN Voter Turnout	Pearson Correlation	-.193**	.331**	.424**	-.255**	-.274**	.553**	1	-.175**	-.244**	-.273**	-.116	-.135*
	Sig. (2-tailed)	.001	.000	.000	.000	.000	.000		.002	.000	.000	.078	.026
	N	314	317	312	306	264	312	317	317	290	313	233	272
LN Housing Price Inequality	Pearson Correlation	.111*	-.207**	-.202**	.008	.173**	-.372**	-.175**	1	.427**	.468**	.192**	.253**
	Sig. (2-tailed)	.049	.000	.000	.887	.005	.000	.002		.000	.000	.003	.000
	N	314	317	312	306	264	312	317	317	290	313	233	272
LN Crime Incidence N1	Pearson Correlation	.183**	-.106	-.373**	.170**	.275**	-.323**	-.244**	.427**	1	.851**	.514**	.533**
	Sig. (2-tailed)	.002	.071	.000	.004	.000	.000	.000	.000		.000	.000	.000
	N	287	290	286	282	244	285	290	290	290	290	233	259
LN Crime Incidence N3	Pearson Correlation	.252**	-.188**	-.367**	.144*	.331**	-.399**	-.273**	.468**	.851**	1	.425**	.534**
	Sig. (2-tailed)	.000	.001	.000	.012	.000	.000	.000	.000	.000		.000	.000
	N	310	313	308	302	261	308	313	313	290	313	233	272
LN Crime Loss and Damage LD1	Pearson Correlation	.086	-.054	-.215**	.096	.132	-.040	-.116	.192**	.514**	.425**	1	.900**
	Sig. (2-tailed)	.195	.408	.001	.148	.062	.544	.078	.003	.000	.000		.000
	N	230	233	230	228	200	229	233	233	233	233	233	233
LN Crime Loss and Damage LD2	Pearson Correlation	.083	-.144*	-.252**	.135*	.175**	-.156*	-.135*	.253**	.533**	.534**	.900**	1
	Sig. (2-tailed)	.175	.017	.000	.029	.008	.010	.026	.000	.000	.000	.000	
	N	269	272	268	264	229	267	272	272	259	272	233	272

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Dependent variable: the condition of yard and fence section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	.871		.223	
LN Social Mobility	-.107	-.035	.650	1.248
Marriage Rate	-.425	-.112	.215	1.670
LN Own Children Under 18 Years Old	.018	.011	.882	1.161
LN Ethnic Diversity	.032	.038	.621	1.187
LN Homeownership Rate**	.221	.231	.022	2.053
LN Voter Turnout**	-.477	-.220	.015	1.634
LN Housing Price Inequality	.102	.081	.320	1.351
Component_1_Crime Loss and Damage	-.019	-.030	.678	1.039
Component_2_Crime Incidence**	.124	.180	.038	1.520

R^2 = 0.122, adjusted R^2 = 0.078, F-ratio = 2.785, n = 318.
* Indicates statistical significance at the 10% level.
** Indicates statistical significance at the 5% level.

Table 96. The result of the multiple regression analysis in the sixth block-level analysis

According to Table 96, three social capital variables (homeownership rate, voter turnout, and crime incidence) have a statistically significant impact on the condition of yard and fence section at a 5% significance level. According to the standardized regression coefficients, the most influential variable regarding the condition of yard and fence section is homeownership rate (Beta=.231). The second most influential variable is voter turnout (Beta=-.220). And the least influential variable regarding the condition of yard and fence section is crime incidence (Beta=.180). Based on the Standardized Coefficients (Beta) of the variable of voter turnout, one standard deviation change in the variable of voter turnout is associated with -0.220 standard deviation change in the dependent variable (the condition of yard and fence section) while controlling all the other social capital variables.

Influential social capital variables associated with the condition of driveway and sidewalk section

According to the results (Table 98) of the correlation analysis, there is no influential social capital variable regarding the condition of driveway and sidewalk section. Also, there is no variable whose correlation coefficient is over 0.2. Thus, most of social capital variables are weakly associated with the condition of driveway and sidewalk section.

Next identified were the social capital variables exhibiting the effect of multicollinearity through correlation analysis. Crime incidence N1 and crime incidence N3 are closely related to each other, and crime loss-damage LD1 and crime loss-damage LD2 also are related to each other. The identified variables exhibiting multicollinearity are combined to control multicollinearity, and the derived variables (components) represented by rotated component scores are used in a multiple regression analysis to find out contributions of each social capital variable including the two components.

Dependent variable: the condition of driveway and sidewalk section

Explanatory variable	Unstandardized Coefficients (B)	Standardized Coefficients (Beta)	p-Value	VIF
(Constant)	1.683		.000	
LN Social Mobility	-.093	-.048	.555	1.281
Marriage Rate*	-.490	-.204	.031	1.708
LN Own Children Under 18 Years Old	.027	.026	.737	1.172
LN Ethnic Diversity	.041	.078	.321	1.187
LN Homeownership Rate	.052	.087	.400	2.054
LN Voter Turnout	.099	.072	.439	1.671
LN Housing Price Inequality	.010	.013	.878	1.352
Component_1_Crime Loss and Damage	-.012	-.029	.689	1.042
Component_2_Crime Incidence	.055	.127	.156	1.525

R^2 = 0.071, adjusted R^2 = 0.024, F-ratio = 1.519, n = 318.

* Indicates statistical significance at the 10% level.

** Indicates statistical significance at the 5% level.

Table 97. The result of the multiple regression analysis in the seventh block-level analysis

Table 98. The result of the correlation analysis
(the condition of driveway and sidewalk section and other independent variables)

		Driveway Sidewalk Condition	LN Social Mobility	Marriage Rate	LN Own Children 18	LN Ethnic Diversity	LN Homeownership Rate	LN Voter Turnout	LN Housing Price Inequality	LN Crime Incidence N1	LN Crime Incidence N3	LN Crime Loss & Damage LD1	LN Crime Loss & Damage LD2
Driveway Sidewalk Condition	Pearson Correlation	1	-.105	-.158**	.098	.111	-.103	-.066	.037	.085	.065	.069	.068
	Sig. (2-tailed)		.063	.005	.088	.074	.069	.245	.518	.153	.252	.296	.266
	N	314	314	309	303	261	309	314	314	287	310	230	269
LN Social Mobility	Pearson Correlation	-.105	1	.292**	-.254**	-.165**	.400**	.331**	-.207**	-.106	-.188**	-.054	-.144*
	Sig. (2-tailed)	.063		.000	.000	.007	.000	.000	.000	.071	.001	.408	.017
	N	314	317	312	306	264	312	317	317	290	313	233	272
Marriage Rate	Pearson Correlation	-.158**	.292**	1	-.359**	-.183**	.514**	.424**	-.202**	-.373**	-.367**	-.215**	-.252**
	Sig. (2-tailed)	.005	.000		.000	.003	.000	.000	.000	.000	.000	.001	.000
	N	309	312	312	305	261	309	312	312	286	308	230	268
LN Own Children 18	Pearson Correlation	.098	-.254**	-.359**	1	.142*	-.196**	-.255**	.008	.170**	.144*	.096	.135*
	Sig. (2-tailed)	.088	.000	.000		.023	.001	.000	.887	.004	.012	.148	.029
	N	303	306	305	306	256	303	306	306	282	302	228	264
LN Ethnic Diversity	Pearson Correlation	.111	-.165**	-.183**	.142*	1	-.261**	-.274**	.173**	.275**	.331**	.132	.175**
	Sig. (2-tailed)	.074	.007	.003	.023		.000	.000	.005	.000	.000	.062	.008
	N	261	264	261	256	264	260	264	264	244	261	200	229
LN Homeownership Rate	Pearson Correlation	-.103	.400**	.514**	-.196**	-.261**	1	.553**	-.372**	-.323**	-.399**	-.040	-.156*
	Sig. (2-tailed)	.069	.000	.000	.001	.000		.000	.000	.000	.000	.544	.010
	N	309	312	309	303	260	312	312	312	285	308	229	267
LN Voter Turnout	Pearson Correlation	-.066	.331**	.424**	-.255**	-.274**	.553**	1	-.175**	-.244**	-.273**	-.116	-.135*
	Sig. (2-tailed)	.245	.000	.000	.000	.000	.000		.002	.000	.000	.078	.026
	N	314	317	312	306	264	312	317	317	290	313	233	272
LN Housing Price Inequality	Pearson Correlation	.037	-.207**	-.202**	.008	.173**	-.372**	-.175**	1	.427**	.468**	.192**	.253**
	Sig. (2-tailed)	.518	.000	.000	.887	.005	.000	.002		.000	.000	.003	.000
	N	314	317	312	306	264	312	317	317	290	313	233	272
LN Crime Incidence N1	Pearson Correlation	.085	-.106	-.373**	.170**	.275**	-.323**	-.244**	.427**	1	.851**	.514**	.533**
	Sig. (2-tailed)	.153	.071	.000	.004	.000	.000	.000	.000		.000	.000	.000
	N	287	290	286	282	244	285	290	290	290	290	233	259
LN Crime Incidence N3	Pearson Correlation	.065	-.188**	-.367**	.144*	.331**	-.399**	-.273**	.468**	.851**	1	.425**	.534**
	Sig. (2-tailed)	.252	.001	.000	.012	.000	.000	.000	.000	.000		.000	.000
	N	310	313	308	302	261	308	313	313	290	313	233	272
LN Crime Loss and Damage LD1	Pearson Correlation	.069	-.054	-.215**	.096	.132	-.040	-.116	.192**	.514**	.425**	1	.900**
	Sig. (2-tailed)	.296	.408	.001	.148	.062	.544	.078	.003	.000	.000		.000
	N	230	233	230	228	200	229	233	233	233	233	233	233
LN Crime Loss and Damage LD2	Pearson Correlation	.068	-.144*	-.252**	.135*	.175**	-.156*	-.135*	.253**	.533**	.534**	.900**	1
	Sig. (2-tailed)	.266	.017	.000	.029	.008	.010	.026	.000	.000	.000	.000	
	N	269	272	268	264	229	267	272	272	259	272	233	272

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

According to Table 97, only one social capital variable (marriage rate) has a statistically significant impact on the condition of driveway and sidewalk section at a 5% significance level. According to the standardized regression coefficients, one standard deviation change in the variable of marriage rate is associated with -0.204 standard deviation change in the dependent variable (the condition of driveway and sidewalk) while controlling for all the other social capital variables.

CHAPTER 6: CONCLUSION

Introduction

This concluding chapter is divided into three sections. The first section summarizes social capital concepts and housing condition. The second section summarizes the results of statistical analyses: block group-level analysis and block-level analysis. Interpretation of the results from statistical analyses is also discussed in the second section. The third section suggests some other ideas for research about the relationship between the level of social capital and the condition of dwelling structure and environment in future research because there are some limitations of this dissertation research. For better statistical findings about the relationship, problems related to collecting data, and finding more appropriate indexes need to be addressed in future research. In this sense, this dissertation research can provide some ideas and suggestions.

Summary of Social Capital Concepts and Housing Condition

There are many similar terms describing social capital, such as social bonds, community networks, social ozone, extended friendships, community life, social resources, informal and formal networks, and social glue (Portes, A. 1998). These various terms are based on different theoretical backgrounds. That is why we have difficulty understanding social capital which is based on various theoretical backgrounds. There is no commonly agreed definition of social capital. The definition of social capital is dependent on the specific disciplines involved and the level of investigation (Robison et al. 2002). Many researchers have their own definitions of social capital and their own measurement approaches based on their research topics.

In spite of the uncertainty and difficulties, the concept of social capital is adopted in various disciplines because of its benefits in studying crime (Halpern 1999, Putnam 2000), health (Wilkinson, 1996), education (Coleman, 1988), child welfare (Healy, T., & Côté, S, 2001), and economic security (Fukuyama, 1995).

Especially, the benefits and importance of the concept of social capital are mentioned continuously in urban planning and urban policy literature. Requena (2003) asserted that the importance of social capital is that it brings together several important sociological concepts such as social support, integration and social cohesion. Other authors have placed an emphasis on economic and political issues (Fukuyama 2001; Kenworthy 1997), on health discipline (Wilkinson 1996), raising educational attainment, lowering crime rate, increasing civic engagement, and environmental management.

In order to understand the social capital concept well, we need to deal with many issues related to the concept including social capital dimensions, types, determinants, levels, and empirical studies. These issues help understand social capital in more detail. First, social capital has various dimensions: trust, community attachment, social ties, norms, network, civic and political engagement, social cohesion, etc. A multi-dimensional characteristic of the social capital concept is the reason people have difficulty understanding the concept. One dimension alone cannot explain or constitute the concept of social capital. A multi-dimensional perspective on social capital is important for this reason. Additionally, there are relationships among the dimensions of the social capital concept. Although it seems that there are many dimensions involving social capital and that they are all separated from each other, they are actually all connected and they have a strong influence on one another.

The types and determinants of social capital are also diverse and important to consider. Bonding or bridging social capital, cognitive or structural social capital, open or closed social capital, and thin or thick social capital, are types of social capital. History, culture, whether social structures are flat or hierarchical, family, education, built environment, residential mobility, economic inequalities and social class, strength and characteristics of civil society, and patterns of individual consumption and personal values are considered main determinants of social capital (Aldridge, Halpern et al, 2002). There is a lack of consensus about definitions, dimensions, and measurement of social capital concept. In the same manner, experts are still disputing the determinants of social capital.

With regard to the level of social capital, social capital has been dealt with at the level of the individual, the informal social group, the formal organization, the community, the ethnic group and even the nation (Coleman 1988; Portes 1998; Putnam 1995). This view toward the level of social capital represents that social capital can be dealt with at all levels: individual, group, community and nation.
The concept of social capital has been used in many disciplines. It reflects the fact that many researchers, urban planners, and policy makers still have an interest in the concept of social capital. In this sense, there have been constant efforts to confirm that social capital has been playing an important role in enhancing sustainable community development. Through many empirical studies including health, crime, economy, education, political engagement, and policy implication done by researchers, it is possible to find the benefits of social capital concept regarding community development.

Dwelling structure and environment involve housing. It does not mean that dwelling structure and environment is just housing structure. The housing structure alone is not enough to describe the overall dwelling structure and environment. The housing structure is just a dwelling building which does not include dwelling environment, such as yard and fence, driveway, and sidewalk. The relationship with social capital can be more fully explained when dwelling structure and environment are considered together.

The main reason for needing a house is associated with dwelling. However, it is not the only reason for the need of housing. A good house is generally expected to provide some services to people living within. One of the services is the structural safety of a building which is important for people to conduct their necessary daily activities in their houses. Protecting people from dangerous environments such as natural hazards, wild animals, etc., is the primary function of a building. In addition, neighborhood services are also among the services that good housing provides people. According to *Housing New York City 2008* (chapter 7 - housing and neighborhood condition, Page 463), “Neighborhood services include not only the physical condition of the neighborhood, but also a broad combination of private and public services needed for daily living.” Physical condition of a neighborhood is partly measured and evaluated by focusing on the structural conditions of buildings in the neighborhood. However, the broad combination of private and public services involve other matters which cannot be measured only by the condition of the physical environment of a neighborhood. Social relationships, interactions, and activities among residents are closely related to the neighborhood services.

Residents are likely to think about their houses in relation to neighborhood services. Even though the primary purpose of their houses is related to dwelling services, housing is more than a dwelling unit because it has social characteristics from a social point of view. (Vera-Toscano, E., & Ateca-Amestoy, V. 2007) In particular, housing has profound influence on the health, efficiency, social behavior, and general welfare of the community. (Kayode Felix Omole, 2010) The decreased overall quality of life leads residents living within improperly maintained residential structures to diminish levels of social interactions or activities with their neighbors. Thus, it is inferred that dwelling structure and environment might be connected with social issues including social capital concept.

Summary of Results regarding the Relationship between Social Capital and Dwelling Structure and Environment

There were four steps in most of the analyses conducted in this dissertation research: normality test, correlation analysis, components analysis, and multiple regression analysis. The variables from not normally distributed data are transformed using the Log Transformation tool in SPSS to make the variables normally distributed. Also identified were relevant variables to be used in components analysis through correlation analysis. The purpose of obtaining the components is related to social capital's uncertain characteristics, to small sample size, and to control the effect of multicollinearity in multiple regression analysis. At the block-group level analysis, a multiple regression analysis helps identify social capital's impact on dwelling structure and environment while controlling for the impacts of neighborhood characteristics on dwelling structure and environment. Once the impact of social capital on dwelling structure and environment is identified at an acceptable significance level, block level analysis is then undertaken to identify influential social capital variables regarding the condition of dwelling structure and environment at smaller geographical scale. The seven classified dependent variables are used in the block group-level analysis and block-level analysis. These two analyses help to further understanding of the relationships between social capital and dwelling structure and environment.

In the first block group-level analysis, the dependent variable is total housing condition which is measured by total composite scores. Total housing condition is composed of four survey sections: housing exterior, garage, yard-fence, and driveway-sidewalk. The total composite score from these four sections represents the overall condition of dwelling structure and environment of a house.

Two groups of independent variables are used in two separate correlation analyses. Before we conduct components analysis, we examine the appropriateness of components analysis through the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett’s Test of Sphericity. In each group, only relevant independent variables which are correlated with the dependent variable (i.e., total housing condition) are used in components analysis. Two components are obtained from the group of social capital variables through the first components analysis. Another two components are obtained from the group of neighborhood characteristics variables through the second components analysis in the first block group-level analysis.

The result of the multiple regression analysis in the first block group-level analysis shows that none of the components obtained from social capital variables influence total housing condition at an acceptable significance level.

In the second block group-level analysis, the dependent variable is structural housing condition. The structural housing condition involves two survey sections of the housing exterior section and the garage section. As was done in the first block group-level analysis (dependent variable: total housing condition), correlation analysis was conducted to identify relevant variables in each group of independent variables (social capital variables and neighborhood characteristics variables) in terms of the correlation with the dependent variable (i.e., structural housing condition). The identified relevant social capital variables and neighborhood characteristics variables are used in separate components analyses to extract components. Three components are obtained from the group of social capital variables and two components are obtained from the group of neighborhood characteristics variables. These five components are used in a multiple regression analysis. The results of the multiple regression analysis reveal that one of the components extracted from the neighborhood characteristics variables has influence on structural housing condition at a 5% significance level. Based on Standardized Coefficients (Beta) of the component extracted from the neighborhood characteristics variables, one standard deviation change in the Neighborhood characteristics Component 1 is associated with 0.439 standard deviation change in the dependent variable (structural housing condition) while controlling for all the other components. Also, one of the components extracted from the social capital variables has a statistically significant impact on structural housing condition at a 5% significance level. The Standardized Coefficient (Beta) of the component extracted from social capital variables shows that one standard deviation change in the social capital Component 3 is associated with 0.463 standard deviation change in the dependent variable (structural housing condition) while controlling for all the other components. Thus, one can assert that a particular aspect of social capital represented by one of the social capital components has an impact on managing structural housing condition at a 5% significance level, as does one of the neighborhood characteristics components.

In the third block group-level analysis, the dependent variable is non-structural housing condition which is related to dwelling environment including yard, fence, driveway, and sidewalk. The procedure to obtain the non-structural housing condition follows exactly the same method used to obtain the former dependent variables (i.e., total housing condition and structural housing condition).

In the same manner as with the former block group-level analyses, among variables in each group it is appropriate to use only relevant variables which are correlated with the dependent variable (non-structural housing condition) in components analysis to extract components. In the group of social capital variables, voter turnout and housing price inequality are the relevant and valid variables (correlation coefficients over 0.3). In the group of neighborhood characteristics variables, the variables of education attainment rate and household crowding are relevant and valid (correlation coefficients over 0.3). Then the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity from each group of independent variables (social capital variables and neighborhood characteristics variables) were checked before conducting components analysis to obtain components from the group. Based on the values of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the significance values for the Bartlett's Test of Sphericity in each data set of independent variables, conducting components analyses in each group of independent variables to obtain components is not appropriate. Thus, conducted was a multiple regression analysis using the four relevant and valid independent variables whose correlation coefficients are over 0.3 from each correlation analysis. Next a multiple regression analysis was conducted using the four relevant independent variables (voter turnout, housing price inequality, education attainment rate, and household crowding) whose correlation coefficients are over 0.3 from each correlation analysis. The results of the multiple regression analysis in the third block group-level analysis reveals that none of the social capital variables and neighborhood characteristics variables influences the non-structural housing condition at a 5% significance level.

In the fourth block group-level analysis, the dependent variable is housing exterior section, which is one of the dwelling structures survey sections. In order to measure the value of the dependent variable which is housing exterior condition, scores from the nine questions on the housing exterior section are combined. Relevant independent variables which are correlated with other independent variables including the dependent variable are found from correlation analysis. Again the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the Bartlett's Test of Sphericity from each group of independent variables (social capital variables and neighborhood characteristics variables) was checked before conducting components analysis to obtain components from the group. In each group of independent variables, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy meets the minimum criteria (0.5) and the significance value for the Bartlett's Test of Sphericity is less than .05, so that conducting components analysis is appropriate in each group of independent variables. The relevant and valid independent variables are used in component analysis, and two components are respectively extracted from each components analysis. These four components are used in a multiple regression analysis. The results of the multiple regression analysis show that one of the social capital components has a nearly statistically significant impact on the exterior condition of housing section (Beta = .431) at a significance level of 0.1.

Based on the Standardized Coefficient (Beta) of the component, one standard deviation change in the social capital Component 1 is associated with 0.431 standard deviation change in the dependent variable (housing exterior condition) while controlling for all the other components. In contrast, other components from neighborhood characteristics variables and the other component from social capital variables do not impact the housing exterior condition at a 10% significance level. Thus, it can be inferred that a particular aspect of social capital which is represented by the first social capital component (social capital Component 1) has some impact on the exterior condition of housing section. Crime incidence N2, crime incidence N3, crime loss and damage LD2, housing price inequality, and ethnic diversity are substantially loaded on the first social capital component.

In the fifth block group-level analysis, the dependent variable is garage condition. Relevant variables from each group of independent variables through correlation analysis were identified. Also examined were the appropriateness of conducting components analysis. Based on the values of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and the significance values for the Bartlett's Test of Sphericity in each group of independent variables, conducting components analysis is appropriate. Through components analysis a total of five components were obtained: three components from social capital variables and another two components from neighborhood characteristics variables. A multiple regression analysis used these five components to identify the impact of social capital on dwelling structure and environment. The statistical results of the multiple regression analysis show that one of the components extracted from neighborhood characteristics variables has a statistically significant impact on the garage condition at a 5% significance level. However, the three components obtained from social capital variables do not have any statistically significant impact on the dependent variable (i.e., garage condition). One can infer that garage condition is more closely associated with neighborhood characteristics than with the level of social capital.

In the sixth block group-level analysis, the dependent variable is the condition of yard and fence. In the group of social capital variables, the variables of housing price inequality and voter turnout are valid and relevant to be used in components analysis. In the group of neighborhood characteristics variables, there are four independent variables identified to be used in components analysis: education attainment rate, median home value, below poverty level, and household crowding. However, according to the results of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity for each group of indendent variables, it is not appropriate to conduct two components analyses to obtain components from each group of independent variables.

In the group of social capital variables, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is .500 which meets the minimum criteria (0.5). However, the significance value for the Bartlett's Test of Sphericity is over .05, so the null hypothesis is not rejected. Some or all of the variables in the data set of social capital in the sixth block group-level analysis are uncorrelated. Thus, conducting components analysis is not appropriate in the group of social capital variables. In the group of neighborhood characteristics variables, the value of the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is 0.190 and the significance value for the Bartlett's Test of Sphericity in the data set of neighborhood characteristics variables is 0.064. One can infer that neighborhood characteristics variables in the data set are uncorrelated. Thus, it is also not appropriate to conduct components analysis in the group of neighborhood characteristics variables.

Then multiple regression analysis was conducted using the six relevant independent variables (voter turnout, housing price inequality, education attainment rate, median home value, below poverty level, and household crowding), whose correlation coefficients are over 0.3 from each correlation analysis. The results of the multiple regression analysis in the six block group-level analysis reveal that none of the social capital variables and neighborhood characteristics variables impacts the condition of yard and fence section at an acceptable significance level.

In the last block group-level analysis with the condition of driveway and sidewalk as a dependent variable, there is no relevant variable found to be used in components analysis in the group of neighborhood characteristics variables. Only one variable, voter turnout, is found to be valid and relevant in the group of social capital variables. Thus, it was not appropriate to conduct components analysis to obtain components from each group of independent variables. Only one social capital variable is directly used in a multiple regression analysis to study the impact of the social capital variable on the condition of driveway and sidewalk. According to the results of the multiple regression analysis, the variable of voter turnout does not significantly influence the condition of driveway and sidewalk.

After studying the impact of social capital on dwelling structure and environment (structural housing condition and housing exterior condition in particular) at a block group-level, block-level analysis was conducted to examine the degree of influence of social capital variables on each classified block level dependent variable (seven classified dependent variables): total housing condition, structural housing condition, non-structural housing condition, housing exterior condition, garage condition, yard/fence condition, and driveway/sidewalk condition. There are total of eleven social capital variables measured at block level in this dissertation research. In order to identify the influential social capital variables regarding dwelling structure and environment at block level, correlation analysis and multiple regression analysis were conducted. The results of each correlation analysis and multiple regression analysis indicated the influential social capital variables in relation to classified dependent variables.

In relation to total housing condition, 'marriage rate' and 'crime incidence N3' ('crime incidence N3' represents the incidence of crime (all types of offenses) normalized by total population of a block group) are found to be closely related to total housing condition based on the correlation coefficients (over 0.3). And we identified the social capital variables exhibiting the effects of multicollinearity through correlation analysis. The identified variables (crime incidence N1, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD2) exhibiting multicollinearity are combined to control multicollinearity for a multiple regression analysis using components analysis. The two components obtained from the components analysis are used in all multiple regression analyses in each block level.

The results of the regression analysis (dependent variable: total housing condition) shows that four social capital variables (social mobility, marriage rate, homeownership rate, and crime incidence) have a statistically significant impact on total housing condition at a 5% significance level. According to the standardized regression coefficients, the most influential variable regarding total housing condition is crime incidence (Beta=.329) which is a composite variable to control the effect of multicollinearity between crime incidence N1 and crime incidence N3.

With regard to structural housing condition, the correlation coefficients from correlation analysis reveal that marriage rate (-.340), housing price inequality (.337), crime incidence N1(.442), and crime incidence N3(.472) are the social capital variables which are closely associated with the structural housing condition at a 5% significance level. Especially, the variable of marriage rate whose correlation coefficient is -.340 shows that the marriage rate is negatively associated with structural housing condition. One can infer that a block with high marriage rate has a lower interim composite score for structural housing condition. This means that structural housing condition is better with higher marriage rates.

The result of the regression analysis (dependent variable: structural housing condition) shows that four social capital variables (social mobility, marriage rate, homeownership rate, and crime incidence) have a statistically significant impact on structural housing condition at a significance level (0.05 and 0.1). According to the standardized regression coefficients of all social capital variables, the most influential variable regarding structural housing condition is crime incidence (Beta=.390) which is a composite variable for all kinds of crime.

In the block-level analysis with the dependent variable of non-structural housing condition, the statistical results indicate that there is no independent variable which is strongly correlated with the dependent variable (non-structural housing condition). All variables' correlation coefficients are less than 0.3. Of course, the variable of marriage rate is found more weakly related to the non-structural housing condition. In order to examine contributions of each independent variable, the standardized regression coefficients are used in a multiple regression analysis. According to the results of the regression analysis (dependent variable: non-structural housing condition), marriage rate (Beta=-.182), homeownership rate (.247), and crime incidence (.226) are the selected variables most affecting the non-structural housing condition at a 5% significance level.

The former block group-level analysis reveals that housing exterior condition is also closely associated with social capital. In other words, social capital has influence on the housing exterior condition. Also, in the block level correlation analysis, the correlation coefficients reveal that there are four social capital variables which are related to the housing exterior condition: marriage rate (-.315), housing price inequality (.329), crime incidence N1(.462), and crime incidence N3 (.471). In particular, crime incidence variables (crime incidence N1 and crime incidence N3) have strong relationships with the housing exterior condition, based on their correlation coefficients.

The results of the regression analysis (dependent variable: housing exterior condition) also show that two social capital variables (social mobility and crime incidence) most affect the housing exterior condition at a 10% significance level. The most influential variable regarding the condition of housing exterior section is crime incidence (Beta=.320). Based on the Standardized Coefficients (Beta) of the variable of crime incidence, one standard deviation change in the variable of crime incidence is associated with 0.320 standard deviation change in the dependent variable (the condition of housing exterior section) while controlling for all the other social capital variables.

Garage is another section of dwelling structure. In the block-level analysis in which the dependent variable is garage condition, there are no social capital variables found to be strongly correlated with the dependent variable. Social capital variables' correlation coefficients are less than 0.2, which means that most of social capital variables in the data set (dependent variable: garage condition) are weakly associated with the garage condition. The results of the regression analysis (dependent variable: garage condition) shows that social mobility, own children under 18 years old, homeownership rate, and crime incidence are the variables which have a statistically significant impact on the garage condition at a 10% significance level. According to the standardized regression coefficients, the most influential variable regarding the condition of garage section is homeownership rate (Beta=.246). The standardized regression coefficients show how much a dependent variable is expected to increase or decrease in Z-score on standard deviation units when an independent variable increases by one standard deviation unit while controlling for all the other variables.

Non-structural housing is classified into two types of sections: yard/fence and driveway/sidewalk. In the block-level analysis (dependent variable: the condition of yard and fence), one can see that there is no significant social capital variable related to the condition of yard and fence based on the statistical results. Except for two variables (marriage rate and crime incidence), most of social capital variables in this data set have correlation coefficients less than 0.2. According to the results of the regression analysis (dependent variable: the condition of yard and fence), homeownership rate, voter turnout, and crime incidence are the variables which have the most impact on the condition of yard and fence section at a 5% significance level. The most influential variable regarding the condition of yard and fence section is homeownership rate (Beta=.231) based on the standardized regression coefficients.

Likewise for the block-level analysis in which the dependent variable is the condition of driveway and sidewalk, most of the social capital variables in this data set have low correlation coefficients. The correlation coefficients are less than 0.2. Also, the results of the regression analysis (dependent variable: the condition of driveway and sidewalk) reveals that only one social capital variable (marriage rate) has a statistically significant impact on the condition of driveway and sidewalk section at a 5% significance level based on its standardized regression coefficient (Beta=-.204).

Discussion

In times past, physical environment factors, such as land-use type and neighborhood design enhancing the level of social capital were main issues to researchers in this field. However, various benefits gained from social capital theory including public health enhancement, raising educational attainment, economic growth, low crime rate, increasing political and civic engagement, and environmental management lead researchers to study about the influence of social capital on various fields. Among various fields, physical urban environment in relation to social capital theory has not been tested empirically or comprehensively because there is a lack of consensus about the measurement of social capital. And only structural housing parts including roof, siding, foundation, windows, and doors were dealt with in their research.

In this dissertation, however, the level of social capital is measured through public data sources not household surveys, such as U.S. Census, the City of Lincoln, Lincoln Police Department, and Lancaster Election Commission. Thus, it was possible to obtain the level of social capital of a community objectively using social capital indicators which are developed based on other literature. Additionally, non-structural housing parts related to dwelling environment (i.e., yard, fence, driveway, and sidewalk) are also dealt with in this dissertation to measure overall housing condition because dwelling structure cannot describe whole concept of housing condition.

For future research, it is needed to clarify the limitations of this dissertation research because the limitations would be relevant to suggest directions for future research. There are three limitations in this dissertation research.

First, the sizes of the samples dealt with in this dissertation are somewhat small. As mentioned previously, the larger the sample size, the higher the statistical power of an analysis. However, it is more difficult and expensive to have a very large sample size (i.e., blocks and block groups) because there are increased costs involving time and effort. In fact, it takes about one hour for one block to be surveyed. In this dissertation research, there are a total of 318 Census blocks in the 30 Census block groups used as samples. The 318 blocks are comprised of 2,659 parcels. It took almost six months to complete the entire survey for this research.

A small sample size is also problematic because small samples do not allow for reliable statistical analysis. As a result, small sample sizes make it difficult to study a statistical population and its characteristics. Having the availability of larger samples of parcel data, one could conduct more reliable statistical analyses.

The second limitation is related to measuring the social capital indices. There are eleven selected variables representing the level of social capital in a community: housing price inequality, homeownership rate, voter turnout, ethnic diversity, family status (marriage rate), family status (own children under 18 years old), social mobility (community attachment), crime incidence N1, crime incidence N3, crime loss and damage LD1, and crime loss and damage LD2. One of the problems related to obtaining social capital index data is that there are not enough sources of data. What could be accessed to obtain these social capital indices are as follows: U.S. Census, the City of Lincoln, Lincoln Police Department, and Lancaster Election Commission. Thus, obtaining various social capital indices is limited, so that only particular aspects of social capital can be addressed. This makes it difficult to assess the relationship between social capital and dwelling structure and environment in more detail. Thus, in future research, there should be efforts to find more relevant social capital index variables. If previous public data are not enough and adequate, we could collect more data from a household survey. The data from a household survey could help to create more comprehensive and sophisticated social capital indices.

The third limitation is the dependent variable. The dependent variable is the condition of dwelling structure and environment. Dwelling structure and environment is classified into seven categories to assess the impact of social capital on the seven classified dependent variables: total housing condition, structural housing condition, non-structural housing condition, housing exterior condition, garage condition, the condition of yard and fence, and the condition of driveway and sidewalk. Collected housing condition data are somewhat subjective, even though in this dissertation research a survey reference guide obtained from the Lincoln Community Assessment (Scan) Project was utilized. Making a housing condition survey more objective is important. So, it is needed to revise a survey reference guide in more detail. When making a composite score for a dependent variable, all survey questions in this dissertation research have the same weight regardless of the importance of each question. As can be acknowledged, the visual impression of each question might be different. However, the same weights were assigned to each question, which may have affected survey-based statistical results. Assigning different weights to each question would make it possible to obtain more accurate and objective dependent variable data. However, it is difficult to evaluate the importance of each question in the survey. Deciding whether a specific question is more important and valuable than other questions is not a simple task. For future research, it is needed to assign different weightings based on each question's importance and value to each question. Collecting opinions of experts and professionals regarding relative weighting problems through mail surveys, reviewing the importance of each component of housing based on literature, empirical test, etc. may help to ascertain each question's importance and value for assigning different weighting. Then, it will help obtain actual and practical composite scores, and one can conduct actual statistical analysis using the data of composite scores.

In this dissertation research, one of the main objectives is to identify the impact of social capital on managing the condition of dwelling structure and environment. To identify the impact, there is a research question to be answered: does social capital have some impact on the condition of dwelling structure and environment? Based on the assumption that the condition of dwelling structure and environment of neighborhoods with a high level of social capital will be better than the condition of dwelling structure and environment of neighborhoods with a low level of social capital, we investigated the impact of social capital on the condition of dwelling structure and environment.

According to the results of block group-level analyses, 30 Census Block groups have different levels of social capital represented by eleven social capital variables. Likewise, the conditions of dwelling structure and environment for the 30 block groups are also different from each other. The results of block group-level analyses show that there is a relationship between the level of social capital and the condition of dwelling structure and environment. This means that social capital has a significant impact on the condition of dwelling structure and environment. In particular, structural housing condition and housing exterior condition which is a portion of the structural housing condition are influenced by the level of social capital at an acceptable significance level. Interestingly, however, total housing condition including structural housing condition and non-structural housing condition is found not to be affected by the level of social capital. This means that structural housing condition is not a large part of total housing condition compared to non-structural housing condition, and housing exterior condition is a large part of structural housing condition compared to garage condition.

If a community has a higher level of social capital, one can expect that there will be many opportunities for social interactions and activities with neighbors in the community. To provide more opportunities for social interactions and activities in a house, houses should be well managed. Social interactions and activities lead people to manage their houses better in order to feel more comfortable inviting their neighbors to their homes. Structural housing condition and housing exterior condition are considered as more important than other components of housing. Thus one can think that when people are invited to have social interactions and activities in neighbors' houses, structural housing condition which involves housing exterior condition, will be a major factor to consider in deciding to join their neighbors in social interactions and activities. However, the conditions of yard and fence, driveway and sidewalk have little influence people in deciding to join the social interactions and activities at an acceptable significance level.

Once the impact of social capital on the condition of dwelling structure and environment is identified at a significance level, block level analysis is conducted. Another objective of this dissertation research is to identify influential social capital variables regarding the condition of dwelling structure and environment. To identify the influential social capital variables, there is a research question to be answered: among social capital variables (indicators), which indicators are closely associated with the condition of dwelling structure and environment? According to the results of block level analyses, influential social capital variables regarding each dependent variable are social mobility, marriage rate, own children under 18 years old, homeownership rate, voter turnout, and crime incidence. These influential indicators are significant to explain variations of dependent variables' values.

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